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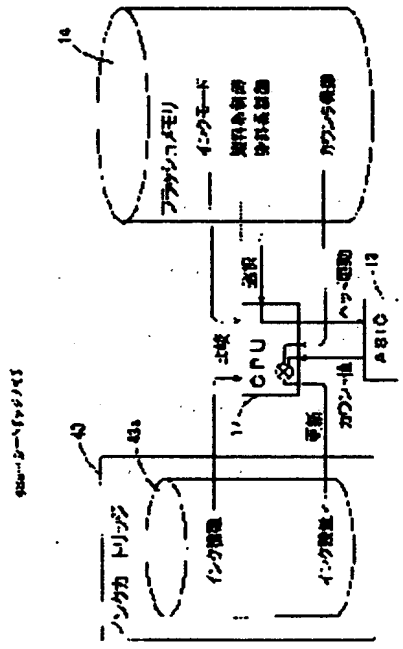
(54) APPARATUS AND METHOD FOR CONTROLLING PRINTER, AND MEDIUM WITH PRINTER CONTROL PROGRAM RECORDED

(57)Abstract:
PROBLEM TO BE SOLVED: To solve the problem that the printing quality is damaged when different system inks mix and a residual amount of ink cannot be properly detected in a printer in which an ink type can be changed by replacing ink cartridges.
SOLUTION: The type of ink and the residual amount of ink are stored in a nonvolatile memory loaded to the ink cartridge. A type of ink is stored when the ink is supplied to an ink feed system. At a printing time, the stored type of ink is compared with the type of ink stored in the nonvolatile memory. Accordingly, printing control conforming to the types of ink when the types of ink agree can be carried out, and mixing inks can be prevented when the types of ink do not agree. Moreover, the residual amount of ink is updated by calculating the amount of ink used in accordance with driving of a head, so that a correct residual amount of ink can be detected.



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CLAIMS

[Claim(s)]
[Claim 1] A printer control unit characterized by providing the following. Nonvolatile memory which is the printer control unit which controls a printer which prints while supplying ink with which an exchangeable ink cartridge was filled up to an arm head, and memorizes a class of ink with which the ink cartridge concerned is filled up while updating of the content of storage is possible and being carried in the above-mentioned ink cartridge The ink cartridge attachment-and-detachment section which enables data transmission and reception from the above-mentioned nonvolatile memory at the time of this ink cartridge wearing while it is removable in the above-mentioned ink cartridge A supply ink storage means to memorize a class of ink currently supplied to an ink supply system from the above-mentioned ink cartridge to the above-mentioned arm head A printing condition storage means to memorize according to a class of ink filled up with printing conditions required for actuation of the above-mentioned arm head by the above-mentioned ink cartridge in the above-mentioned printing, A class of ink memorized by a class of ink and the above-mentioned supply ink storage means which were memorized by the above-mentioned nonvolatile memory is compared. A head actuation control means which writes predetermined information in the above-mentioned nonvolatile memory suitably, controlling actuation of an arm head by the condition that a class of both ink is in agreement, based on printing conditions memorized by the above-mentioned printing condition storage means
[Claim 2] It is the printer control unit characterized by updating a residue of ink which the above-mentioned nonvolatile memory had memorized a residue of ink with which it fills up at an ink cartridge in a printer control unit given in above-mentioned claim 1, and was memorized by the above-mentioned nonvolatile memory based on the calculation concerned while the above-mentioned head actuation control means computed the amount of ink used consumed with actuation of the above-mentioned arm head.
[Claim 3] It is the printer control unit characterized by computing the amount of the ink used based on a counter which the above-mentioned head actuation control means increases with actuation of the above-mentioned arm head in a printer control unit of a publication to above-mentioned claim 2.
[Claim 4] It is the printer control unit characterized by memorizing the amount calculation coefficient of the ink used for computing the amount of the ink used by multiplying by the above-mentioned printing condition storage means in a printer control unit given in above-mentioned claim 3 at counted value of the above-mentioned counter.
[Claim 5] It is the printer control unit characterized by memorizing a driver voltage pattern impressed in case the above-mentioned printing condition storage means drives the above-mentioned arm head in a printer control unit given in either above-mentioned claim 1 - claim 4.
[Claim 6] It is the printer control unit characterized by the above-mentioned printing condition storage means memorizing actuation conditions required for cleaning of an ink supply system in the above-mentioned arm head in a printer control unit given in either above-mentioned claim 1 - claim 5.
[Claim 7] It is the printer control unit characterized by the above-mentioned printing condition storage means memorizing actuation conditions required for Flushing in the above-mentioned

arm head in a printer control unit given in either above-mentioned claim 1 - claim 6.
[Claim 8] It is the printer control unit characterized by the ability to set up so that either or combination of the above-mentioned nonvolatile memory, a supply ink storage means, and a printing condition storage means may forbid a store and elimination of storage information in a printer control unit given in either above-mentioned claim 1 - claim 7.
[Claim 9] It is the printer control unit characterized by the above-mentioned head actuation control means performing a comparison of a class of the above-mentioned ink in a printer control unit given in either above-mentioned claim 1 - claim 8 at the time of exchange of the above-mentioned ink cartridge.
[Claim 10] It is the printer control unit characterized by updating a class of ink memorized by the above-mentioned supply ink storage means after the above-mentioned head actuation control means supplies ink to the above-mentioned ink supply system in a printer control unit given in either above-mentioned claim 1 - claim 9 by class of the supplied ink concerned.
[Claim 11] A printer control method characterized by providing the following. The supply ink storage process of being the printer control method which controls a printer which prints while carrying nonvolatile memory which memorizes a class of ink with which updating of the content of storage is possible and it fills up and supplying ink with which an exchangeable ink cartridge was filled up by detaching and attaching to an applied part to an arm head, and memorizing a class of ink currently supplied to an ink supply system from the above-mentioned ink cartridge to the above-mentioned arm head A printing condition storage process memorized according to a class of ink filled up with printing conditions required for actuation of the above-mentioned arm head by the above-mentioned ink cartridge in the above-mentioned printing The head actuation control process which writes predetermined information in the above-mentioned nonvolatile memory suitably, controlling actuation of an arm head by the condition that compare a class of ink memorized by a class of ink and the above-mentioned supply ink storage process memorized by the above-mentioned nonvolatile memory, and a class of both ink is in agreement, based on printing conditions memorized by the above-mentioned printing condition storage process
[Claim 12] The printer control method characterized by to update a residue of ink which memorized a residue of ink with which the above-mentioned nonvolatile memory is filled up at an ink cartridge, and was memorized by the above-mentioned nonvolatile memory based on the calculation concerned while computing the amount of ink used consumed with actuation of the above-mentioned arm head at the above-mentioned head actuation control process in a printer control method given in above-mentioned claim 11.
[Claim 13] A printer control method characterized by computing the amount of the ink used based on a counter which increases to above-mentioned claim 12 with actuation of the above-mentioned arm head at the above-mentioned head actuation control process in a printer control method of a publication.
[Claim 14] A printer control method characterized by memorizing the amount calculation coefficient of the ink used for computing the amount of the ink used by taking the advantage of above-mentioned claim 13 at the above-mentioned printing condition storage process in a printer control method of a publication at counted value of the above-mentioned counter.
[Claim 15] A printer control method characterized by memorizing a driver voltage pattern impressed in case the above-mentioned arm head is driven at the above-mentioned printing condition storage process in a printer control method given in either above-mentioned claim 11 - claim 14.
[Claim 16] A printer control method characterized by memorizing actuation conditions required for cleaning of an ink supply system in the above-mentioned arm head at the above-mentioned printing condition storage process in a printer control method given in either above-mentioned claim 11 - claim 15.
[Claim 17] A printer control method characterized by memorizing actuation conditions required for Flushing in the above-mentioned arm head at the above-mentioned printing condition storage process in a printer control method given in either above-mentioned claim 11 - claim 16.
[Claim 18] It is the printer control method characterized by the ability to set up so that either or combination of the above-mentioned nonvolatile memory, a supply ink storage process, and a

printing condition storage process may forbid a store and elimination of storage information in a printer control method given in either above-mentioned claim 11 - claim 17.
[Claim 19] A printer control method characterized by performing a comparison of a class of the above-mentioned ink at the time of exchange of the above-mentioned ink cartridge at the above-mentioned head actuation control process in a printer control method given in either above-mentioned claim 11 - claim 18.
[Claim 20] A printer control method characterized by updating a class of ink memorized at the above-mentioned supply ink storage process after supplying ink at the above-mentioned head actuation control process in a printer control method of a publication at the above-mentioned ink supply system to either above-mentioned claim 11 - claim 19 by class of the supplied ink concerned.
[Claim 21] While carrying nonvolatile memory which memorizes a class of ink with which updating of the content of storage is possible and it fills up It is data medium which recorded a printer control program for controlling by computer a printer which prints while supplying ink with which an exchangeable ink cartridge was filled up by detaching and attaching to an applied part to an arm head. A function to read a class of ink memorized by nonvolatile memory of the above-mentioned ink cartridge, and to judge a class of ink in an ink cartridge, A function which reads a class of ink which the printer concerned beforehand indicated to nonvolatile memory carried in the above-mentioned main part of a printer is using, While comparing a class of ink by which reading appearance was carried out [above-mentioned] to a class of ink of the judged above-mentioned ink cartridge Printing conditions memorized according to a class of ink in nonvolatile memory carried in the above-mentioned main part of a printer when a class of both ink was in agreement are read. Data medium which recorded a printer control program characterized by making a computer perform a head actuation control function which writes predetermined information in nonvolatile memory of the above-mentioned ink cartridge suitably, controlling actuation of the above-mentioned arm head.
[Claim 22] It is data medium which recorded the printer control program characterized by to make the residue of the ink which had memorized the residue of the ink in which an ink cartridge is filled up with the above-mentioned nonvolatile memory in data medium which recorded a printer control program of a publication on above-mentioned claim 21, and was memorized by the above-mentioned nonvolatile memory based on the calculation concerned in the above-mentioned head actuation control function while having computed the amount of ink used consumed with actuation of the above-mentioned arm head update.
[Claim 23] Data medium which recorded a printer control program characterized by computing the amount of the ink used by the above-mentioned head actuation control function based on a counter which increases with actuation of the above-mentioned arm head in data medium which recorded a printer control program of a publication on above-mentioned claim 22.
[Claim 24] Data medium which recorded a printer control program characterized by memorizing the amount calculation coefficient of the ink used for computing the amount of the ink used by taking the advantage of counted value of the above-mentioned counter in data medium which recorded a printer control program of a publication on above-mentioned claim 23 by nonvolatile memory which memorizes the above-mentioned printing conditions according to a class of ink.
[Claim 25] Data medium which recorded a printer control program characterized by memorizing a driver voltage pattern impressed in case the above-mentioned arm head is driven in data medium which recorded a printer control program of a publication on either above-mentioned claim 21 - claim 24 by nonvolatile memory which memorizes the above-mentioned printing conditions according to a class of ink.
[Claim 26] Data medium which recorded a printer control program characterized by memorizing actuation conditions required for cleaning of an ink supply system in the above-mentioned arm head in data medium which recorded a printer control program of a publication on either above-mentioned claim 21 - claim 25 by nonvolatile memory which memorizes the above-mentioned printing conditions according to a class of ink.
[Claim 27] Data medium which recorded a printer control program characterized by memorizing actuation conditions required for Flushing in the above-mentioned arm head in data medium

which recorded a printer control program of a publication on either above-mentioned claim 21 - claim 26 by nonvolatile memory which memorizes the above-mentioned printing conditions according to a class of ink.

[Claim 28] Either or combination of nonvolatile memory carried in the above-mentioned ink cartridge and a main part of a printer in data medium which recorded a printer control program of a publication on either above-mentioned claim 21 - claim 27 is data medium which recorded a printer control program characterized by the ability to set up so that a store and elimination of storage information may be forbidden.

[Claim 29] Data medium which recorded a printer control program characterized by performing a comparison of a class of the above-mentioned ink at the time of exchange of the above-mentioned ink cartridge by the above-mentioned head actuation control function in data medium which recorded a printer control program of a publication on either above-mentioned claim 21 - claim 28.

[Claim 30] Data medium which recorded a printer control program characterized by to update a class of ink memorized in nonvolatile memory carried in the above-mentioned main part of a printer by the above-mentioned head actuation control function in data medium which recorded a printer control program of a publication on either above-mentioned claim 21 - claim 29 after supplying ink to the above-mentioned ink supply system by class of the supplied ink concerned.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] This invention relates to data medium which recorded the printer control unit, the printer control method, and the printer control program.
[0002]
[Description of the Prior Art] As a printer which can perform printing according to image quality equivalent to a photograph, an ink jet printer is spreading quickly in recent years. Generally in this ink jet printer, two kinds such as pigment system ink and color system ink are used. With each property, two kinds of this ink has merits and demerits in image quality, lightfastness, etc., and is widely used by both. Moreover, even if it is the case where viscosity differs from density etc. and the two above-mentioned kinds of ink uses the same arm head, in order to perform suitable printing, making it correspond to said property, control conditions, such as discharge quantity of ink and regurgitation timing, differ in pigment system ink and color system ink, respectively.
[0003]
[Problem(s) to be Solved by the Invention] The following technical problems occurred in the conventional ink jet printer mentioned above. That is, wearing of the ink cartridge of a class which makes a mistake in two kinds of ink, and is different before carrying out exchange and washing of an ink supply system also in an usable printer will mix the ink of a different system inside an ink supply system. Since it becomes impossible to perform discharge quantity control according to the property of ink etc. when two kinds of ink has been mixed, printing quality is spoiled. Therefore, in order to exchange the two above-mentioned kinds of ink and to prevent mixing of the ink in an ink supply system in an usable ink jet printer, exchange and washing of an ink supply system are needed at the time of exchange of an ink class.
[0004] Furthermore, although the residue of the ink with which the ink cartridge is filled up in the ink jet printer may be supervised and it may display as the status Before exhausting ink in the conventional ink jet printer mentioned above, from an exchangeable thing, an ink cartridge in pigment system ink and color system ink When the class of ink was changed and the class of ink was returned further once again after using ink to the middle, there was a problem that the ink residue of the original cartridge could not be judged correctly.
[0005] This invention was made in view of the above-mentioned technical problem, and even if it changes an ink cartridge what times, it aims at offering the printer control unit which can judge an ink residue correctly, the printer control method, and a printer control unit, while carrying out proper control according to an ink class, preventing mixing of the ink of a different system in the printer which can exchange an ink class.
[0006]
[Means for Solving the Problem] Invention which starts claim 1 in order to attain the above-mentioned object is constituted so that a printer which prints while supplying ink with which an exchangeable ink cartridge was filled up to an arm head may be controlled, and it is controlled, preventing mixing of an ink class. For this reason, nonvolatile memory which can update the content of storage is carried in an exchangeable ink cartridge, and a class of ink with which an

ink cartridge is filled up is memorized by this nonvolatile memory. This ink cartridge is detached and attached through an ink cartridge applied part by main part of a printer, and data transmission and reception from the above-mentioned nonvolatile memory are possible for it at the time of wearing.

[0007] Furthermore, a class of ink currently supplied to an ink supply system which consists of ink supply tubes from an ink cartridge to an arm head etc. is memorized by supply ink storage means, and printing conditions required for actuation of an arm head are memorized by printing condition storage means according to a class of ink. A head actuation control means uses such storage information in printing, and compares a class of ink memorized by a class of ink and the above-mentioned supply ink storage means which were memorized by nonvolatile memory. And actuation of an arm head is controlled based on printing conditions which drive an arm head in the condition that a class of both ink is in agreement, and suit this ink class in agreement.

[0008] Namely, a class of ink memorized by the above-mentioned nonvolatile memory is uniquely in agreement with a class of ink with which an ink cartridge was filled up. Since a class of ink memorized by supply ink storage means is uniquely in agreement with a class of ink currently supplied to an ink supply system When a head actuation control means compares these, it can prevent driving an arm head using an ink cartridge of a class of different ink from a class of ink already supplied to an ink supply system, and mixing of ink can be prevented.

[0009] Here, updating of the content of storage is possible for it, and if the above-mentioned nonvolatile memory is nonvolatile, can adopt good various modes and is constituted from EEPROMs, such as a flash memory, it is suitable. Moreover, although what is necessary is just to memorize whether a class of ink is the thing of whether restoration ink is the thing of a color system as information which is used in order to prevent mixing of ink as mentioned above, and for that shows a class of ink, and a pigment system, it is possible to memorize various information in addition to this as a class of ink. That is, by referring to the restoration day concerned, if a restoration day of ink is memorized, it can constitute so that ink over which the expiration date passed may not be used. Moreover, even if it is ink of a same system, actuation of an arm head is controllable by the best actuation sequence over the ink by memorizing information which shows a purport from which a component differs.

[0010] It is removable in an ink cartridge, and the ink cartridge attachment-and-detachment section equips a holder of a fitting type with a container which has capacity which can be filled up with ink that what is necessary is just to be able to enable data transmission and reception from nonvolatile memory at the time of ink cartridge wearing, and a configuration which secures a flow of a terminal of nonvolatile memory to fitting concerned and coincidence is possible for it. It can constitute from rewritable various memory that what is necessary is just to be able to memorize a class of ink currently supplied to an ink supply system in a supply ink storage means. Although RAM etc. can constitute, if a printer is frequently constituted from EEPROMs, such as a flash memory, a place whose power supply is what is turned on / turned off, it is suitable.

[0011] It can constitute from various memory that what is necessary is just to be able to memorize according to a class of ink filled up with printing conditions required for actuation of an arm head by the above-mentioned ink cartridge in a printing condition storage means. Although a mask ROM etc. can also constitute, the status changes with activities serially, and since it is the mode which can change activity ink, if especially this invention is constituted from EEPROMs, such as a rewritable flash memory, it is suitable [this invention] for a printer. If a head control driving means is constituted from a CPU etc., it is [that what is necessary is to read and calculate information from various memory etc. and just to be able to control memory, an arm head, etc.] suitable.

[0012] As a configuration for controlling to be able to judge an ink residue correctly, furthermore, invention according to claim 2 In a printer control unit given in above-mentioned claim 1 the above-mentioned nonvolatile memory A residue of ink with which an ink cartridge is filled up is memorized, and the above-mentioned head actuation control means is considered as a configuration which updates a residue of ink memorized by the above-mentioned nonvolatile memory based on the calculation concerned while it computes the amount of ink used consumed with actuation of the above-mentioned arm head.

[0013] That is, since a residue of ink is updated with actuation of a printer, it becomes the residue of proper ink. Since a residue of ink is memorized by nonvolatile memory carried in the ink cartridge itself, it removes, before consuming ink with which it filled up, other ink cartridges are used, and an ink residue will become proper even if it uses an ink cartridge removed again. of course ,-- even if it uses it, removing an ink cartridge and making other printers equip -- being concerned -- others -- if a printer control unit which requires a printer for this invention is provided, it will become a proper ink residue.

[0014] Moreover, the technique of computing the amount of ink used by head actuation control means is various, and invention according to claim 3 is considered as a configuration which computes the amount of the ink used based on a counter which the above-mentioned head actuation control means increases with actuation of the above-mentioned arm head in a printer control unit given in above-mentioned claim 2 as an example of a configuration for it. That is, since an arm head drives at the time of printing, if a counter which counted value increases with actuation of the arm head concerned is used, based on the counted value concerned, the amount used is easily computable. The technique of more specifically counting the number of dots which carries out the regurgitation by arm head is employable. What is necessary is just to compute the amount used for every class of ink based on the number of dots, although the amount used may change with classes of ink also with the same number of dots since a class of ink can be changed in this invention. Thus, when computing the amount of ink used based on counted value, especially this count should just form a single counter, without distinguishing according to a class of ink.

[0015] As an example of printing conditions which various conditions exist as printing conditions required for actuation of the above-mentioned arm head, and need to be memorized according to a class of ink, furthermore, invention according to claim 4 In a printer control unit given in above-mentioned claim 3, the above-mentioned printing condition storage means is considered as a configuration which memorizes the amount calculation coefficient of the ink used for computing the amount of the ink used by taking an advantage at counted value of the above-mentioned counter.

[0016] That is, since above-mentioned counted value and the amount of ink used are usually in proportionality, if the amount calculation coefficient of the ink used which computes the amount of the ink used by taking the advantage of counted value is prepared, the amount used can be easily obtained from counted value only by 1 time of multiplication. Moreover, it can constitute very easily [that the amount coefficient of the ink used for every class of ink may only be memorized], and in order to compute the amount used for every class of ink, also when it is necessary to correspond to ink in which a class of ink increases or properties differ, it can respond easily.

[0017] Furthermore, invention according to claim 5 is considered as a configuration which memorizes a driver voltage pattern impressed in case the above-mentioned printing condition storage means drives the above-mentioned arm head in a printer control unit given in either above-mentioned claim 1 - claim 4 as other examples of printing conditions which need to be memorized according to a class of ink. That is, when classes of ink differ like ink of a pigment system, and ink of a color system, conditions which drive an arm head differ. For example, if the above-mentioned ink classes differ in the case of a printer which controls discharge quantity, regurgitation timing, etc. of ink by telescopic motion of a piezo-electric element etc., 1 time of ink discharge quantity differs from regurgitation timing etc. Since it is controlled by changing a driver voltage pattern impressed to an arm head, such discharge quantity etc. can perform printing according to a class of ink easily, if a driver voltage pattern is memorized according to a class of ink as printing conditions.

[0018] Furthermore, invention according to claim 6 is considered as a configuration which memorizes actuation conditions which the above-mentioned printing condition storage means needs for cleaning of an ink supply system in the above-mentioned arm head in a printer control unit given in either above-mentioned claim 1 - claim 5 as other examples of printing conditions which need to be memorized according to a class of ink. Namely, since an ink supply system may be cleaned, ink is once discharged in this case and wiping etc. is carried out when a case where

a printer is not used for a long time, and printing quality have deteriorated, in order to make blowdown perform exactly, it is necessary to drive an arm head a condition for every class of ink, and, in such a case, can respond.
[0019] Furthermore, since a class of ink can be exchanged in this invention, it is necessary to also wash an ink supply system from a cartridge to an arm head on the occasion of exchange, and when performing this washing sequence, in order to make ink of an ink supply system discharge exactly, it is necessary to drive an arm head a condition for every class of ink, and, also in such a case, can respond.
[0020] Furthermore, invention according to claim 7 is considered as a configuration which memorizes actuation conditions which the above-mentioned printing condition storage means needs for Flushing in the above-mentioned arm head in a printer control unit given in either above-mentioned claim 1 - claim 6 as other examples of printing conditions which need to be memorized according to a class of ink. Namely, although Flushing may be performed in order to carry out regurgitation blowdown of the color mixture ink which flowed backwards from a nozzle by wiping or to prevent blinding by thickening of ink, from it being what should be determined with the property of an ink class, timing which performs this Flushing, and a regurgitation discharge at the time of Flushing need to drive an arm head a condition for every class of ink, in order to perform Flushing exactly, and, in such a case, can respond.
[0021] Furthermore, when a power supply of a printer is turned off suddenly, mixing of ink is prevented after re-powering on. As an example for judging an ink residue appropriately and constituting it possible [activation of head actuation for every class of ink] exactly, invention according to claim 8 In a printer control unit given in either above-mentioned claim 1 - claim 7, either or combination of the above-mentioned nonvolatile memory, a supply ink storage means, and a printing condition storage means is considered as a configuration which can be set up so that a store and elimination of storage information may be forbidden.
[0022] That is, if a store and elimination of storage information can be forbidden, when a case where a power supply was turned off suddenly and a power supply becomes instability, and a noise increase, required storage information is not updated and a printer can be driven in the original condition after re-powering on. For example, since storage information on a supply ink storage means is still origin, in spite of having already supplied ink after re-powering on at an ink supply system, it is going to perform supply of further different ink and ink is not mixed. Moreover, an arm head is not driven using ink currently supplied to an ink supply system, and different ink. Furthermore, when a power supply becomes instability, information for computing the above-mentioned amount of the ink used is memorized for a printing condition storage means etc., and if an ink residue is updated based on the memorized amount of the ink used concerned after a power supply is stable, a more exact ink residue can be obtained. Here, as a flume which forbids a store and elimination of storage information, when storage information needs to be updated of course, it updates by canceling a prohibition condition of a store and elimination.
[0023] Furthermore, invention according to claim 9 is considered as a configuration in which the above-mentioned head actuation control means performs a comparison of a class of the above-mentioned ink at the time of exchange of the above-mentioned ink cartridge in a printer control unit given in either above-mentioned claim 1 - claim 8 as an example of a configuration for controlling to prevent mixing of ink in the above-mentioned head actuation control means. That is, a printer concerning this invention is considered [mistaking a class of ink in many cases at the time of this exchange since it is exchangeable, and] in an ink cartridge, and can prevent mixing of ink certainly by performing the above-mentioned comparison at the time of this exchange. It constitutes so that various modes can be adopted in order to detect exchange of an ink cartridge here, for example, it may remove with the time of wearing of an ink cartridge and a predetermined signal may sometimes be outputted, and when a signal which shows wearing is detected, it can constitute so that a comparison may be performed.
[0024] Furthermore, invention according to claim 10 has considered [as an example of the configuration for preventing mixing of ink in the above-mentioned head actuation control means] as the configuration which updates at a class of the supplied ink concerned in a class of ink

memorized by the above-mentioned supply ink storage means in a printer control unit given in either above-mentioned claim 1 - claim 9, after the above-mentioned head actuation control means supplies ink to the above-mentioned ink supply system.
[0025] That is, since a printer concerning this invention can change suitably a class of ink used by exchange of a cartridge, in case it changes a class of the ink concerned, it will also wash ink currently supplied to the above-mentioned ink supply system, and will newly be resupplied. Then, if a class of ink memorized by supply ink storage means by head actuation control means after supply of ink to an ink supply system is updated, an arm head can be driven using always proper ink by the comparison of a class of the above-mentioned ink, even if it carries out the message exchange of ink what times, and mixing of ink can be prevented.
[0026] Thus, while memorizing a class of ink, and a residue of ink to nonvolatile memory carried in an ink cartridge and preventing mixing of ink with reference to these, the technique of grasping a residue of ink proper does not necessarily need to be restricted to equipment with substance, and functioning also as the method can be understood easily. For this reason, invention concerning claim 11 - claim 20 is considered as a configuration corresponding to a control method which said printer control unit enforces. That is, there is no difference not only in equipment which not necessarily has substance but in being effective as the method.
[0027] By the way, such a printer control unit contains not only this but various kinds of modes as thought of that it may be used in the condition of existing independently and having been included in a certain device, and invention. Therefore, it can change suitably that it is software or hardware etc. When becoming the software of a printer control unit as an example of embodiment of thought of invention, naturally it exists on a record medium which recorded this software, and it must be said that it is used. Invention which starts claim 21 - claim 30 in the semantics is considered as a configuration corresponding to each step which makes said printer control unit carry out by computer.
[0028] of course, the record medium may be magnetic-recording data medium, may be magneto-optic-recording data medium, and can completely be considered the same way in any record media developed from now on. Moreover, about duplicate phases, such as a primary replica and a secondary replica, it is equivalent without room to completely ask. If above-mentioned data medium is the case where it carries out as the supply method using a communication line although it differs, a communication line serves as a transmission medium and this invention will be used.
[0029] Furthermore, a part is software, when a part is realized by hardware, there is nothing that is completely different in thought of invention, and it may be made into a thing of a gestalt which memorizes a part on a record medium and is read suitably if needed. Moreover, when carrying out this invention by software, it not only realizes as data medium by which invention recorded a program, but naturally this invention is realized as the program itself, and the program itself is included in this invention.
[0030]
[Effect of the Invention] According to invention which starts claim 1, claim 11, and claim 21 as explained above, mixing of ink can be prevented, and data medium which recorded the printer control unit which can perform suitable control according to the class of ink, the printer control method, and the printer control program can be offered.
[0031] Moreover, according to invention concerning claim 2, claim 12, and claim 22, the proper ink residue in an ink cartridge can be judged. Furthermore, according to invention concerning claim 3, claim 13, and claim 23, the amount of the ink used is easily computable. Furthermore, according to invention concerning claim 4, claim 14, and claim 24, the configuration for computing the amount used for every class of ink can be realized easily, and the amount used can be easily obtained from counted value. Furthermore, according to invention concerning claim 5, claim 15, and claim 25, printing according to the class of ink can be performed easily.
[0032] Furthermore, according to invention concerning claim 6, claim 16, and claim 26, it can clean the condition for every class of ink. Furthermore, according to invention concerning claim 7, claim 17, and claim 27, Flushing can be performed the condition for every class of ink. Furthermore, according to invention concerning claim 8, claim 18, and claim 28, when the power

supply of a printer is turned off suddenly, mixing of ink can be prevented after re-powering on, an ink residue can be judged appropriately, and head actuation for every class of ink can be performed exactly. Furthermore, according to invention concerning claim 9, claim 19, and claim 29, mixing of ink can be prevented certainly. Furthermore, according to invention concerning claim 10, claim 20, and claim 30, mixing of ink can be prevented certainly.
[0033]
[Embodiment of the Invention] Hereafter, the operation gestalt of this invention is explained based on a drawing. Drawing 1 is the outline perspective diagram showing the internal configuration of the ink jet printer carrying the printer control unit concerning 1 operation gestalt of this invention, and drawing 2 is the block diagram showing the connection condition of each hardware of the ink jet printer concerned. In drawing, it has the Maine substrate 11 and the printing section 20, the panel section 30, and the cartridge section 40 are connected to the Maine substrate 11, and an ink jet printer 10 functions as a printer, when CPU12 which it had on the Maine substrate 11 controls each part.
[0034] On the Maine substrate 11, it has others, ASIC13, a flash memory 14, and the head actuator 16. [above / CPU 12] ASIC13 is IC customized since the arm head 22 mentioned later was driven, and it performs processing for head 22 actuation, transmitting and receiving the above CPU 12 and a predetermined signal. As one of the processing of this, it has the amount counter of the ink used, and the number of dots printed is counted for every ink color. In addition, the applied-voltage data to the head actuator 16 which mentions later is outputted. The head actuator 16 generates the applied-voltage pattern to the piezo-electric element built in the arm head 22 which is the circuit which consists of Dedication IC, a transistor for actuation, a heat sink, etc., and is mentioned later.
[0035] A flash memory 14 is EEPROM which can eliminate the content of storage electrically, and can eliminate data per a chip package or block. Furthermore, the flash memory 14 concerning this operation gestalt is a boot block mold, and can forbid the store and elimination of hardware-data to a predetermined block.
[0036] The printing section 20 is mainly equipped with the roller 21 and the arm head 22, and the arm head 22 is connected with the above-mentioned Maine substrate 11 through the predetermined trunk cable. Rotating by the motor which is driven by the motor control section which is not illustrated and which is not illustrated, the roller 21 is constituted so that a print sheet may be sent. while the arm head 22 is carried in the carriage which is not illustrated and this carriage makes an arm head 22 arrange near the periphery of the above-mentioned roller 21 -- an arm head 22 -- the shaft orientations of a roller 21 -- a round trip -- it is made movable.
[0037] Tube 22a of each ink color exception is connected to the arm head 22, and supply of each color ink is received. Moreover, the arm head 22 is equipped with the piezo-electric element which is not illustrated, and when a piezo-electric element drives at the ink room which is open for free passage from above-mentioned tube 22a to a delivery, the regurgitation of the ink is carried out per dot. The wiring on a predetermined trunk cable and a substrate connects, and this head actuator 16 impresses this generation voltage to an arm head 22 while generating predetermined voltage according to the command from the above ASIC 13, and as for an arm head 22 and the head actuator 16, it drives the above-mentioned carriage and a piezo-electric element.
[0038] The panel section 30 is equipped with the liquid crystal display object 31 and the manual operation button 32, and the panel section 30 is connected with the above-mentioned Maine substrate 11 by the predetermined trunk cable through panel I/O33. The liquid crystal display object 31 is a display which displays an alphabetic character etc. based on the predetermined signal transmitted from CPU12, and can display an error message, the status, etc. A manual operation button 32 is a carbon button used in case a user and a serviceman operate an ink jet printer 10, and by independent carbon button pushing actuation or two or more carbon button pushing actuation, the above CPU 12 distinguishes the content of actuation, and can direct now ON/OFF of a power supply, blowdown of print data, discharge of an error message, activation of the ink message exchange, activation of cleaning, etc.
[0039] The cartridge section is mainly equipped with the sub substrate 41, the cartridge holder

42, and the ink cartridge 43. The ink jet printer 10 concerning this operation gestalt uses cyanogen, a Magenta, yellow, light cyanogen, a light Magenta, and six colors of black, and fills up an ink cartridge 43 with each ink. The ink cartridge carries cartridge memory 43a, and the class of ink and the residue of ink with which it fills up are memorized by this cartridge memory 43a. Here, the data in which it is shown whether it is color system ink as a class of ink or it is pigment system ink is recorded. That is, this cartridge memory 43a constitutes the above-mentioned nonvolatile memory. Each cartridge holder 42 is equipped with contact section 42a with cartridge memory 43a, if the cartridge holder 42 is equipped with an ink cartridge 43, will contact cartridge memory 43a and will secure the connection for data transmission and reception. Moreover, the above-mentioned cartridge holder 42 is equipped with the ink supply needle which is not illustrated, if equipped with an ink cartridge 43, will contact the ink feed hopper with which this ink cartridge 43 is equipped and which is not illustrated, and will form the supply path of ink. The ink with which tube 22a was attached in the cartridge holder 42, and it filled up in the ink cartridge 43 through this tube 22a is supplied to the above-mentioned arm head 22.

[0040] It is carried in an ink jet printer 10 by equipping the cartridge holder 42 with each ink cartridge 43, and where the cartridge holder 42 is equipped, while ink supply is attained through the above-mentioned tube 22a, transmission and reception of data of the above-mentioned cartridge memory 43a are attained. That is, the predetermined trunk cable 40 is connected to the cartridge holder 42, and where the cartridge holder 42 is equipped with an ink cartridge 43, the communication line of the trunk cable 40 concerned and cartridge memory 43a is secured. Thus, in this operation gestalt, the cartridge holder 42 constitutes the above-mentioned applied part.

[0041] The above-mentioned cartridge memory 43a is controlled by transmitting and receiving a predetermined signal from control IC41a which the trunk cable 40 connected to the cartridge holder 42 was connected to the sub substrate 41, and was carried on this sub substrate 41. The sub substrate 41 is connected to the above-mentioned Maine substrate 11 through the further predetermined trunk cable. The above-mentioned control IC41a is IC carried in order to control using two or more ink, i.e., two or more cartridge memory 43a, and performs read-out of the class of ink recorded on cartridge memory 43a, renewal of an ink residue, etc. by CPU12 on the Maine substrate transmitting and receiving a predetermined signal, and performing control IC41a and a communication link. Moreover, in this operation gestalt, in order to distinguish whether attachment and detachment of an ink cartridge 43 were performed, when the above-mentioned control IC41a outputs the signal which shows removal of an ink cartridge 43 when an ink cartridge 43 is removed from the cartridge holder 42 and it is equipped with an ink cartridge 43, the above-mentioned control IC41a outputs the signal which shows wearing of an ink cartridge 43.

[0042] On the above-mentioned Maine substrate 11, it has further predetermined communication link I/O15, and connects with the computer 50 of the exterior of an ink jet printer 10 through this communication link I/O15. If the driver for this ink jet printer 10 is installed in the computer 50 and a user performs printing of digital photograph data, while a driver will perform predetermined data conversion etc., print data and printing directions are transmitted to an ink jet printer 10, and the above CPU 12 prints print data according to printing directions.

[0043] Drawing 3 shows the important section of the memory map of a flash memory 14. Since the both sides of the ink of a color system and the ink of a pigment system are usable, in order that they may perform suitable control to the ink of both systems in a flash memory 14, as for the ink jet printer 10 concerning this operation gestalt, the parameter according to system of ink etc. is memorized. The initial flag which shows whether initial restoration filled up with predetermined ink in an ink supply system, i.e., the above-mentioned tube 22a, was specifically performed, and the ink mode which shows the class of ink current in use are memorized.

[0044] Furthermore, the printing conditions which are an actuation parameter according to class of ink are memorized to each of the ink of a pigment system, and the ink of a color system. These data is memorized by the protection block which can forbid the store and elimination of hardware-data. Thus, in this operation gestalt, a flash memory 14 constitutes the above-

mentioned supply ink storage means and a printing condition storage means. There are a counter coefficient, driver voltage, cleaning conditions, and the Flushing conditions as printing conditions, and a counter coefficient is a coefficient by which the counted value in the above ASIC 13 is multiplied, and computes appropriately the amount of the ink used of both a pigment system and a color system from a unified count which is called the number of dots by the multiplication concerned. Moreover, since the ink of a pigment system differs from the ink of a color system, the property, i.e., the viscosity etc., of ink etc., though same actuation of the regurgitation of ink, cleaning, Flushing, etc. is carried out, concrete actuation of an arm head 22 differs.

[0045] Then, driver voltage, cleaning conditions, and the Flushing conditions are memorized for every system, and CPU12 reads this data and directs it to the above ASIC 13, and when the head actuator 16 carries out predetermined head actuation according to the directions concerned, suitable control is performed to the ink of both systems. For example, driver voltage is data in which the pattern of the applied voltage generated in the above-mentioned head actuator 16 at the time of printing is shown, and impresses voltage by pattern which is different as shown in drawing 4 .

[0046] That is, if the driver voltage as printing conditions consists of a look-up table which indicated timer data and CPU12 directs to ASIC13 with reference to this lookup data, ASIC13 will change the timer data concerned and will output applied-voltage data to the head actuator 16. The head actuator 16 generates the pulse which is the temporal response of voltage with said applied-voltage data. While a pulse mainly has a lifting pulse and a downward pulse and applied voltage rises in a lifting pulse, the above-mentioned piezo-electric element drives, and the capacity of an ink room decreases. Moreover, while applied voltage descends in a downward pulse, the above-mentioned piezo-electric element drives, and the capacity of an ink room increases. Therefore, by adjusting the width of face of these pulses, the voltage which the above-mentioned head actuator 16 generates becomes abbreviation trapezoidal shape as shown in drawing 4 , and the regurgitation of ink is controlled by this voltage.

[0047] The voltage pattern of this drawing 4 upside is the thing of a pigment system, inputs a downward pulse in a period t11 first, and makes the capacity of an ink room increase in the ink of the pigment system concerned. And after falling and making the condition of ink attach by suspending the input of a pulse in a period t12, and holding a piezo-electric element, a lifting pulse is inputted, the capacity of an ink room is decreased, and ink is made to breathe out in a period t13. Furthermore, the input of a pulse is suspended in a period t14, this condition is held, a downward pulse is inputted in a period t15, and regurgitation ink is divided. Then, while suspending the input of a pulse in a period t16 and carrying out fixed period maintenance of this condition, carriage is driven and the ink regurgitation sequence over the following dot is performed.

[0048] On the other hand, the voltage pattern of the drawing 4 bottom is the thing of a color system, in the ink of the color system concerned, inputs a lifting pulse in a period t21 first, and decreases the capacity of an ink room. And after falling and making the condition of ink attach by suspending the input of a pulse in a period t22, and holding a piezo-electric element, this condition is held in a period t24, it falls and the condition of ink is made to input a downward pulse, to make the capacity of an ink room increase, and to attach in a period t23. Furthermore, a lifting pulse is inputted again, the capacity of an ink room is decreased, and ink is made to breathe out in a period t25. This condition is held in next in a period t26, a downward pulse is inputted into it in a period t27, regurgitation ink is divided, this condition is held in a period t28, and the regurgitation sequence of 1 dot is ended.

[0049] Thus, in the ink of a pigment system, and the ink of a color system, head actuation patterns also differ from the difference in an ink property, in order to perform control suitable for each system, driver voltage is held according to the ink system, and according to the class of ink, it is referred to suitably. Besides the driver voltage at the time of this printing, it is generable [the head actuator 16 / the voltage for cleaning or Flushing], and an arm head 22 can perform the regurgitation of the ink which is unrelated to printing with the voltage concerned. That is, on the other hand, the pump unit 24 is arranged directly under the edge, and attraction of thickening ink and initial restoration processing to tube 22a can be performed by making negative pressure

act to the arm head 22 of a reciprocating motion of an arm head 22 conveyed to this pump-unit location.
[0050] The head actuator 16 impresses predetermined driver voltage to a pump unit 24 through the cable which is not illustrated. If fixed time amount passes during printing, the Flushing conditions according to the class of ink will be referred to. An arm head 22 is made to perform the predetermined ink regurgitation, and while referring to the cleaning conditions according to an ink class according to the predetermined actuation in the above-mentioned manual operation button 32, predetermined cleaning actuation can be performed on an arm head 22. Furthermore, after exchange of an ink cartridge, initial restoration processing to tube 22a is performed.
[0051] Drawing 5 is the schematic diagram having shown the outline of the control which the printer control unit applied to this invention in the above-mentioned configuration carries out. In order for the above CPU 12 to bear the main control in the printer control unit and to perform processing according to the class of ink, CPU12 compares the ink mode memorized by the class and flash memory 14 of the ink memorized by the above-mentioned cartridge memory 43a. It prints in the condition of having made in agreement the class of ink in which under the current activity memorized as ink mode (i.e., an ink supply system) is filled up with ink, and the class of ink with which the ink cartridge 43 is filled up.
[0052] Moreover, since an arm head 22 is driven on the conditions which suited the class of ink it was presupposed that it was in agreement of ink with these comparisons, with reference to a flash memory 14, an arm head 22 is driven using the parameter of pigment system control or color system control according to the class of ink current in use. Furthermore, by updating it from the ink residue of the above-mentioned cartridge memory 43a, as the amount used concerned is reduced, while computing the amount of the ink used by multiplying the number of dots counted by ASIC13 by the counter coefficient according to the class of ink, even if it is pigment system ink and is color system ink, the ink residue is memorized to accuracy. Thus, in this operation gestalt, CPU12, ASIC13, the head actuator 16, and control IC41a constitute the above-mentioned head actuation control means.
[0053] Drawing 6 -8 show the flow chart of the processing which CPU12 performs with an ink jet printer 10 including the above control. Drawing 6 is processing performed after boot of an ink jet printer 10, and CPU12 distinguishes whether the above-mentioned initial flag is ON with reference to a flash memory 14 at step S100. Processing for being filled up with ink in the tube 22a concerned is performed noting that ink supply systems, such as above-mentioned tube 22a, are not filled up with ink, when it is not distinguished at this step S100 that an initial flag is ON.
[0054] At this time, in step S105, CPU12 performs the above-mentioned control IC41a and a communication link, carries out reading appearance of the ink class of cartridge memory 43a to this control IC41a, and grasps the class of ink of six colors each. At step S110, it distinguishes whether the class of this read ink is the same class also as six colors, when it is not distinguished that it is the same class, the panel section 30 is controlled by step S115 through above-mentioned panel I/O33, and the error message A shown in the liquid crystal display object 31 at drawing 9 is displayed.
[0055] An error message A is a message "six colors of cartridges are not unified", and the processing after the above-mentioned step S105 is repeated, urging exchanging the ink cartridge 43 which the user was mistaken in and was inserted where the message concerned is displayed to a proper thing. When the class of ink is distinguished at the above-mentioned step S110 as it is the same class also as six colors, restoration processing of ink to an ink supply system is performed at step S120. The restoration processing concerned is a special sequence which makes an ink supply system fill up with ink, after this sequence is performed, an ink supply system is filled up with the ink in an ink cartridge, and the ink interior of a room of an arm head 22 is also filled up with ink. Therefore, if the piezo-electric element in an arm head 22 is driven in this condition, ink will be breathed out from the nozzle of an arm head 22.
[0056] After this restoration processing, the class of ink which accessed the above-mentioned flash memory 14 at step S125, and carried out [above-mentioned] restoration is set up as ink mode. Furthermore, the above-mentioned flash memory 14 is accessed at step S130, and the above-mentioned initial flag is set. When it is distinguished at the case where such restoration

processing is performed, and the above-mentioned step S100 that an initial flag is ON, while accessing the above-mentioned flash memory 14 at step S135 and reading the above-mentioned ink mode, reading appearance of the ink class of cartridge memory 43a is carried out to the above-mentioned control IC41a at step S140, and the class of ink with which the ink cartridge 43 with which it is equipped was filled up is grasped.

[0057] And it distinguishes whether the ink mode memorized by the class and flash memory 14 of the ink filled up with step S145 into the ink cartridge 43 is in agreement. When both were in agreement at step S145 and it is distinguished, printing processing is performed at step S200. If both are in agreement at step S145, when not being distinguished, the panel section 30 is controlled by step S150 through above-mentioned panel I/O33, and the error message B shown in the liquid crystal display object 31 at drawing 10 is displayed.

[0058] An error message B is a message of "being equipped with the ink in which ink modes differ", and the processing after the above-mentioned step S140 is repeated, urging exchanging the ink cartridge 43 which the user was mistaken in and was inserted where the message concerned is displayed to a proper thing. Processing which is standing by and shows that print-data transmission is carried out with printing directions from the above-mentioned computer 50 in printing processing of step S200 to drawing 7 after printing directions is performed.

[0059] At step S205, the above ASIC 13 is accessed, a counter is cleared to "0" at the amount step S210 of the ink used in this ASIC13, reading appearance of the ink class of cartridge memory 43a is carried out to the above-mentioned control IC41a at step S210, and the class of ink with which the ink cartridge 43 with which it is equipped was filled up is grasped. And a flash memory 14 is accessed at step S215, and the printing conditions which suited the class of the ink concerned are read.

[0060] Printing is performed driving a part for a predetermined line based on the print data transmitted from the above-mentioned computer 50 after step S220. At step S220, with reference to the driver voltage of the printing conditions which suited the class of the above-mentioned ink, a command is transmitted to the above ASIC 13, and an arm head 22 is driven by making the head actuator 16 output the above-mentioned pulse. Thus, an arm head 22 is driven, and at step S225, the count is performed by ASIC13, moving an arm head 22 by carriage and performing printing.

[0061] after printing for a predetermined line is completed, reading appearance of the counter coefficient which accessed the flash memory 14 at step S230, and suited the class of ink is carried out, and the amount of the ink used is computed by multiplying by the counter coefficient concerned which carried out reading appearance and the counted value of the above ASIC 13 at step S235. As the amount of the ink used which computed the command at this step S235 from delivery and the ink residue memorized at cartridge memory 43a is reduced to the above-mentioned control IC41a, it is made to update the ink residue concerned at step S240. In step S245, the above ASIC 13 is accessed and a counter is again cleared to "0" at the amount step S210 of the ink used in this ASIC13.

[0062] And the processing after the above-mentioned step S220 is repeated until it distinguishes that it was finished whether printing all the print data transmitted from the above-mentioned computer 50 in step S250 and having finished printing is distinguished. In addition, in one end position of a reciprocating motion according [the above-mentioned arm head 22] to carriage, Flushing is made with this operation gestalt. That is, after fixed time amount passes during printing, an arm head 22 is conveyed even to the Flushing field, and Flushing is performed, reading the Flushing conditions which suit the class of ink read from the flash memory 14 at the above-mentioned step S210. Moreover, when an ink cartridge 43 is removed in this operation gestalt, in order to prevent continuing performing printing, when the signal which control IC41a outputs when the above-mentioned ink cartridge 43 is removed is detected, processing which interrupts processing of steps S205-S250 of drawing 7 , and is shown in drawing 8 is performed.

[0063] If the signal which shows that the ink cartridge 43 was removed is detected, the panel section 30 will be controlled by step S305 through above-mentioned panel I/O33, and the error message C shown in the liquid crystal display object 31 at drawing 11 will be displayed. An error message C is a message "equip with a cartridge", and the processing after the above-mentioned

step S305 is repeated until the signal which shows that it equipped with the ink cartridge 43 at step S310 is detected a user urging equipping with an ink cartridge 43 where the message concerned is displayed. If the signal which shows that it equipped with the ink cartridge 43 at step S310 is detected, while accessing the above-mentioned flash memory 14 at step S315 and reading the above-mentioned ink mode, reading appearance of the ink class of cartridge memory 43a is carried out to the above-mentioned control IC41a at step S320, and the class of ink with which the ink cartridge 43 with which it is equipped was filled up is grasped.

[0064] And it distinguishes whether the ink mode memorized by the class and flash memory 14 of the ink filled up with step S325 into the ink cartridge 43 is in agreement. If both are in agreement at step S325, when not being distinguished, the panel section 30 is controlled by step S330 through above-mentioned panel I/O33, and the error message B shown in the liquid crystal display object 31 at drawing 10 is displayed. when both were in agreement at step S325 and it is distinguished, reading appearance of the counter coefficient which accessed the flash memory 14 at step S325, and suited the class of ink is carried out, and the amount of the ink used is computed by multiplying by the counted value currently held at step S340 by the counter coefficient which carried out reading appearance and Above ASIC 13 concerned.

[0065] As the amount of the ink used which computed the command at this step S340 from delivery and the ink residue memorized at cartridge memory 43a is reduced to the above-mentioned control IC41a, it is made to update the ink residue concerned at step S345. That is, after the restoration ink of an ink cartridge 43 with which it is re-equipped judges whether it is the right, an ink residue is updated based on the counted value counted until the cartridge was extracted. Therefore, even if it is the case where an ink cartridge 43 is in the middle of printing, and is removed, it becomes a right ink residue. Then, it returns to the printing processing shown in above-mentioned drawing 7 .

[0066] Furthermore, in this operation gestalt, it is usable in the both sides of the ink of a pigment system, and the ink of a color system, and the class of the ink concerned can be changed. On the occasion of exchange of an ink system, if the ink of both systems is mixed, in a print, it will not become suitable coloring, and various inconvenience arises from the actuation patterns of head 22 grade differing. Therefore, on the occasion of exchange of an ink system, it is necessary to also carry out washing of the above-mentioned ink supply system. When a user or a serviceman performs predetermined pushing actuation with the manual operation button 32 of the above-mentioned panel section 30, it is possible to carry out the message exchange of ink.

[0067] That is, if predetermined pushing actuation is performed in the above-mentioned manual operation button 32, the predetermined trigger according to the actuation concerned will be outputted, and if CPU12 receives the trigger concerned, even if printing will perform, the message exchange shown in step S400 of drawing 6 is performed. Expressing a predetermined guidance message on the liquid crystal display object 31 of the above-mentioned panel section 30 as step S410 in this message exchange, it is made to equip with the cartridge by which the penetrant remover went into the cartridge holder 42, and the washing sequence over an ink supply system is performed. Since the ink supply system of an ink jet printer 10 of after this washing processing is the same as that of an off, a new condition and a new EQC, i.e., an initial flag, condition, processing after the above-mentioned step S105 is performed.

[0068] Furthermore, if cleaning actuation which washes the arm head 22 other than the washing processing at the time of this ink system modification can be performed and predetermined pushing actuation is performed with the manual operation button 32 of the above-mentioned panel section 30 If the predetermined trigger according to the actuation concerned is outputted and CPU12 receives the trigger concerned The wiping member which CPU12 becomes from elastic plates, such as rubber, after it discharges directions by delivery and it makes the head actuator 16 discharge ink with negative pressure through the above ASIC 13 performs wiping actuation on the front face of head.

[0069] Hereafter, the example of operation performed with this operation gestalt by the above-mentioned configuration and the processing flow is explained. Drawing 12 shows the signal outputted when the content and cartridge in ink mode which are memorized by the class and flash memory 14 of the ink with which it filled up in each ink cartridge 43 are removed, and the

counted value in ASIC13 by the timing chart. Suppose that the ink cartridge of the ink of a pigment system, yellow (Y), and a light Magenta (LM) is filled up with the ink of a color system at the ink cartridge of cyanogen (C), a Magenta (M), black (K), and light cyanogen (LC) as an initial state in this example of operation.

[0070] In this condition, if an ink jet printer 10 is booted, processing shown in above-mentioned drawing 6 is performed, and it distinguishes whether an initial flag is ON at step S100, and read-out of the ink class in step S105 and distinction in step S110 will be performed noting that an initial flag is not ON. Here, since the thing of a pigment system and the thing of a color system are intermingled, the ink with which the ink cartridge is filled up displays an error message A on the liquid crystal display object 31 in step S115 through distinction of step S110.

[0071] A user grasps that the class of ink is intermingled by checking this error message A by looking, and he equips with the ink cartridge of the yellow with which the ink of a pigment system was filled up, and a light Magenta while he removes the ink cartridge of the above-mentioned yellow and a light Magenta at time of day t1. Consequently, it will distinguish, if the ink of the same class is filled up with step S110 into all ink cartridges, initial restoration to an ink supply system is performed at step S120, and while setting ink mode as a flash memory 14 as a pigment system at step S125, an initial flag is set at step S130.

[0072] Furthermore, the class of ink may be mistaken, when the initial flag is turned on and an ink jet printer 10 is conveyed, and an ink cartridge 43 is once removed and it equips with it again. For example, suppose that it equipped with the ink cartridge 43 into which the ink of a color system was filled up with time of day t2, and the ink jet printer 10 was booted after carrying out the above-mentioned initial restoration.

[0073] In this case, if the initial flag is turned on at step S100, after distinguishing, the purport whose ink mode memorized by the flash memory 14 at step S135 is a pigment system is grasped, the class of ink memorized by cartridge memory 43a at step S140 is read, and the purport which is a color system is grasped. As a result, at step S145, it will be distinguished if both are not in agreement, and an error message B is displayed on the liquid crystal display object 31.

[0074] By checking this error message B by looking, a user grasps having mistaken the class of ink and reequips with the ink cartridge 43 into which the ink of a pigment system was filled up with time of day t3. Consequently, it will be distinguished if ink mode and the ink class of ink cartridge with which it is equipped are in agreement at step S145, and printing processing of step S200 is performed. If printing processing is started, the counted value of the amount counter of the ink used of the above ASIC 13 will be cleared by "0" at step S205, a flash memory 14 will be referred to at step S210, and the purport by which ink mode is set as the pigment system will be grasped.

[0075] CPU12 reads the printing conditions which suit the pigment system concerned at step S215 with reference to a flash memory 14 further, and performs printing by the processing after step S220. At this time, the above-mentioned counted value of ASIC13 increases with printing activation. If printing is continued as it is, it will result in printing termination soon, but when a user removes an ink cartridge 43 (this example light Magenta) by a certain reason in the time of day t4 before resulting in printing termination, the above-mentioned control IC41a outputs the signal of a purport with which the ink cartridge was removed.

[0076] Consequently, the printing processing which CPU12 was performing is interrupted and the flow of drawing 8 is performed. That is, an error message C is displayed on the liquid crystal display object 31 at step S305, and when a user checks this error message C by looking, it urges reequipping with an ink cartridge 43. If a user equips with an ink cartridge 43, processing after step S315 will be performed through distinction of step S310, but when it equips with the ink cartridge 43 with which the ink of a color system which is different from other ink cartridges 43 at time of day t5 accidentally was filled up, an error message B is further displayed by processing of step S315 - step S330.

[0077] If it changes into the suitable cartridge by which the ink cartridge 43 was filled up with time of day t6 into pigment system ink when a user checked the error message concerned by looking, a flash memory 14 will be accessed at step S335 through distinction of step S325, and the counter coefficient of a pigment system will be read. And by multiplying the counted value

counted till the above-mentioned time of day t4 at step S340 by the counter coefficient concerned, the amount of the ink used is computed and cartridge memory 43a is updated through the above-mentioned control IC41a at step S345. That is, since an ink residue is updated when it equips with the again proper ink cartridge 43, while the counted value till then is held even if an ink cartridge 43 is removed in the middle of printing, the ink residue memorized by cartridge memory 43a will become proper.

[0078] Thus, in this invention, the class of ink memorized by the class and the above-mentioned nonvolatile memory of the ink which memorized the class of ink and the residue of ink to the nonvolatile memory carried in the ink cartridge, memorized the class of the ink when supplying ink to the ink supply system, and was said-memorized at the time of printing is compared. Consequently, when both are in agreement, printing control which suited the class of the ink concerned can be performed, and mixing of ink can be prevented. Moreover, the amount of the ink used is computed according to head actuation, and since the residue of ink is updated, a proper ink residue can be judged.

[Translation done.]

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TECHNICAL FIELD

[The technical field to which invention belongs] This invention relates to data medium which recorded the printer control unit, the printer control method, and the printer control program.

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PRIOR ART

[Description of the Prior Art] As a printer which can perform printing according to image quality equivalent to a photograph, an ink jet printer is spreading quickly in recent years. Generally in this ink jet printer, two kinds such as pigment system ink and color system ink are used. With each property, two kinds of this ink has merits and demerits in image quality, lightfastness, etc., and is widely used by both. Moreover, even if it is the case where viscosity differs from density etc. and the two above-mentioned kinds of ink uses the same arm head, in order to perform suitable printing, making it correspond to said property, control conditions, such as discharge quantity of ink and regurgitation timing, differ in pigment system ink and color system ink, respectively.

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3.In the drawings, any words are not translated.

EFFECT OF THE INVENTION

[Effect of the Invention] According to invention which starts claim 1, claim 11, and claim 21 as explained above, mixing of ink can be prevented, and data medium which recorded the printer control unit which can perform suitable control according to the class of ink, the printer control method, and the printer control program can be offered.
[0031] Moreover, according to invention concerning claim 2, claim 12, and claim 22, the proper ink residue in an ink cartridge can be judged. Furthermore, according to invention concerning claim 3, claim 13, and claim 23, the amount of the ink used is easily computable. Furthermore, according to invention concerning claim 4, claim 14, and claim 24, the configuration for computing the amount used for every class of ink can be realized easily, and the amount used can be easily obtained from counted value. Furthermore, according to invention concerning claim 5, claim 15, and claim 25, printing according to the class of ink can be performed easily.
[0032] Furthermore, according to invention concerning claim 6, claim 16, and claim 26, it can clean the condition for every class of ink. Furthermore, according to invention concerning claim 7, claim 17, and claim 27, Flushing can be performed the condition for every class of ink. Furthermore, according to invention concerning claim 8, claim 18, and claim 28, when the power supply of a printer is turned off suddenly, mixing of ink can be prevented after re-powering on, an ink residue can be judged appropriately, and head actuation for every class of ink can be performed exactly. Furthermore, according to invention concerning claim 9, claim 19, and claim 29, mixing of ink can be prevented certainly. Furthermore, according to invention concerning claim 10, claim 20, and claim 30, mixing of ink can be prevented certainly.
[0033]
[Embodiment of the Invention] Hereafter, the operation gestalt of this invention is explained based on a drawing. Drawing 1 is the outline perspective diagram showing the internal configuration of the ink jet printer carrying the printer control unit concerning 1 operation gestalt of this invention, and drawing 2 is the block diagram showing the connection condition of each hardware of the ink jet printer concerned. In drawing, it has the Maine substrate 11 and the printing section 20, the panel section 30, and the cartridge section 40 are connected to the Maine substrate 11, and an ink jet printer 10 functions as a printer, when CPU12 which it had on the Maine substrate 11 controls each part.
[0034] On the Maine substrate 11, it has others, ASIC13, a flash memory 14, and the head actuator 16. [above / CPU 12] ASIC13 is IC customized since the arm head 22 mentioned later was driven, and it performs processing for head 22 actuation, transmitting and receiving the above CPU 12 and a predetermined signal. As one of the processing of this, it has the amount counter of the ink used, and the number of dots printed is counted for every ink color. In addition, the applied-voltage data to the head actuator 16 which mentions later is outputted. The head actuator 16 generates the applied-voltage pattern to the piezo-electric element built in the arm head 22 which is the circuit which consists of Dedication IC, a transistor for actuation, a heat sink, etc., and is mentioned later.
[0035] A flash memory 14 is EEPROM which can eliminate the content of storage electrically, and can eliminate data per a chip package or block. Furthermore, the flash memory 14 concerning this operation gestalt is a boot block mold, and can forbid the store and elimination of

hardware-data to a predetermined block.
[0036] The printing section 20 is mainly equipped with the roller 21 and the arm head 22, and the arm head 22 is connected with the above-mentioned Maine substrate 11 through the predetermined trunk cable. Rotating by the motor which is driven by the motor control section which is not illustrated and which is not illustrated, the roller 21 is constituted so that a print sheet may be sent. while the arm head 22 is carried in the carriage which is not illustrated and this carriage makes an arm head 22 arrange near the periphery of the above-mentioned roller 21 -- an arm head 22 -- the shaft orientations of a roller 21 -- a round trip -- it is made movable.
[0037] Tube 22a of each ink color exception is connected to the arm head 22, and supply of each color ink is received. Moreover, the arm head 22 is equipped with the piezo-electric element which is not illustrated, and when a piezo-electric element drives at the ink room which is open for free passage from above-mentioned tube 22a to a delivery, the regurgitation of the ink is carried out per dot. The wiring on a predetermined trunk cable and a substrate connects, and this head actuator 16 impresses this generation voltage to an arm head 22 while generating predetermined voltage according to the command from the above ASIC 13, and as for an arm head 22 and the head actuator 16, it drives the above-mentioned carriage and a piezo-electric element.
[0038] The panel section 30 is equipped with the liquid crystal display object 31 and the manual operation button 32, and the panel section 30 is connected with the above-mentioned Maine substrate 11 by the predetermined trunk cable through panel I/O33. The liquid crystal display object 31 is a display which displays an alphabetic character etc. based on the predetermined signal transmitted from CPU12, and can display an error message, the status, etc. A manual operation button 32 is a carbon button used in case a user and a serviceman operate an ink jet printer 10, and by independent carbon button pushing actuation or two or more carbon button pushing actuation, the above CPU 12 distinguishes the content of actuation, and can direct now ON/OFF of a power supply, blowdown of print data, discharge of an error message, activation of the ink message exchange, activation of cleaning, etc.
[0039] The cartridge section is mainly equipped with the sub substrate 41, the cartridge holder 42, and the ink cartridge 43. The ink jet printer 10 concerning this operation gestalt uses cyanogen, a Magenta, yellow, light cyanogen, a light Magenta, and six colors of black, and fills up an ink cartridge 43 with each ink. The ink cartridge carries cartridge memory 43a, and the class of ink and the residue of ink with which it fills up are memorized by this cartridge memory 43a. Here, the data in which it is shown whether it is color system ink as a class of ink or it is pigment system ink is recorded. That is, this cartridge memory 43a constitutes the above-mentioned nonvolatile memory. Each cartridge holder 42 is equipped with contact section 42a with cartridge memory 43a, if the cartridge holder 42 is equipped with an ink cartridge 43, will contact cartridge memory 43a and will secure the connection for data transmission and reception. Moreover, the above-mentioned cartridge holder 42 is equipped with the ink supply needle which is not illustrated, if equipped with an ink cartridge 43, will contact the ink feed hopper with which this ink cartridge 43 is equipped and which is not illustrated, and will form the supply path of ink. The ink with which tube 22a was attached in the cartridge holder 42, and it filled up in the ink cartridge 43 through this tube 22a is supplied to the above-mentioned arm head 22.
[0040] It is carried in an ink jet printer 10 by equipping the cartridge holder 42 with each ink cartridge 43, and where the cartridge holder 42 is equipped, while ink supply is attained through the above-mentioned tube 22a, transmission and reception of data of the above-mentioned cartridge memory 43a are attained. That is, the predetermined trunk cable 40 is connected to the cartridge holder 42, and where the cartridge holder 42 is equipped with an ink cartridge 43, the communication line of the trunk cable 40 concerned and cartridge memory 43a is secured. Thus, in this operation gestalt, the cartridge holder 42 constitutes the above-mentioned applied part.
[0041] The above-mentioned cartridge memory 43a is controlled by transmitting and receiving a predetermined signal from control IC41a which the trunk cable 40 connected to the cartridge holder 42 was connected to the sub substrate 41, and was carried on this sub substrate 41. The

sub substrate 41 is connected to the above-mentioned Maine substrate 11 through the further predetermined trunk cable. The above-mentioned control IC41a is IC carried in order to control using two or more ink, i.e., two or more cartridge memory 43a, and performs read-out of the class of ink recorded on cartridge memory 43a, renewal of an ink residue, etc. by CPU12 on the Maine substrate transmitting and receiving a predetermined signal, and performing control IC41a and a communication link. Moreover, in this operation gestalt, in order to distinguish whether attachment and detachment of an ink cartridge 43 were performed, when the above-mentioned control IC41a outputs the signal which shows removal of an ink cartridge 43 when an ink cartridge 43 is removed from the cartridge holder 42 and it is equipped with an ink cartridge 43, the above-mentioned control IC41a outputs the signal which shows wearing of an ink cartridge 43.

[0042] On the above-mentioned Maine substrate 11, it has further predetermined communication link I/O15, and connects with the computer 50 of the exterior of an ink jet printer 10 through this communication link I/O15. If the driver for this ink jet printer 10 is installed in the computer 50 and a user performs printing of digital photograph data, while a driver will perform predetermined data conversion etc., print data and printing directions are transmitted to an ink jet printer 10, and the above CPU 12 prints print data according to printing directions.

[0043] Drawing 3 shows the important section of the memory map of a flash memory 14. Since the both sides of the ink of a color system and the ink of a pigment system are usable, in order that they may perform suitable control to the ink of both systems in a flash memory 14, as for the ink jet printer 10 concerning this operation gestalt, the parameter according to system of ink etc. is memorized. The initial flag which shows whether initial restoration filled up with predetermined ink in an ink supply system, i.e., the above-mentioned tube 22a, was specifically performed, and the ink mode which shows the class of ink current in use are memorized.

[0044] Furthermore, the printing conditions which are an actuation parameter according to class of ink are memorized to each of the ink of a pigment system, and the ink of a color system. These data is memorized by the protection block which can forbid the store and elimination of hardware-data. Thus, in this operation gestalt, a flash memory 14 constitutes the above-mentioned supply ink storage means and a printing condition storage means. There are a counter coefficient, driver voltage, cleaning conditions, and the Flushing conditions as printing conditions, and a counter coefficient is a coefficient by which the counted value in the above ASIC 13 is multiplied, and computes appropriately the amount of the ink used of both a pigment system and a color system from a unified count which is called the number of dots by the multiplication concerned. Moreover, since the ink of a pigment system differs from the ink of a color system, the property, i.e., the viscosity etc., of ink etc., though same actuation of the regurgitation of ink, cleaning, Flushing, etc. is carried out, concrete actuation of an arm head 22 differs.

[0045] Then, driver voltage, cleaning conditions, and the Flushing conditions are memorized for every system, and CPU12 reads this data and directs it to the above ASIC 13, and when the head actuator 16 carries out predetermined head actuation according to the directions concerned, suitable control is performed to the ink of both systems. For example, driver voltage is data in which the pattern of the applied voltage generated in the above-mentioned head actuator 16 at the time of printing is shown, and impresses voltage by pattern which is different as shown in drawing 4 .

[0046] That is, if the driver voltage as printing conditions consists of a look-up table which indicated timer data and CPU12 directs to ASIC13 with reference to this lookup data, ASIC13 will change the timer data concerned and will output applied-voltage data to the head actuator 16. The head actuator 16 generates the pulse which is the temporal response of voltage with said applied-voltage data. While a pulse mainly has a lifting pulse and a downward pulse and applied voltage rises in a lifting pulse, the above-mentioned piezo-electric element drives, and the capacity of an ink room decreases. Moreover, while applied voltage descends in a downward pulse, the above-mentioned piezo-electric element drives, and the capacity of an ink room increases. Therefore, by adjusting the width of face of these pulses, the voltage which the above-mentioned head actuator 16 generates becomes abbreviation trapezoidal shape as shown in drawing 4 , and the regurgitation of ink is controlled by this voltage.

[0047] The voltage pattern of this drawing 4 upside is the thing of a pigment system, inputs a downward pulse in a period t11 first, and makes the capacity of an ink room increase in the ink of the pigment system concerned. And after falling and making the condition of ink attach by suspending the input of a pulse in a period t12, and holding a piezo-electric element, a lifting pulse is inputted, the capacity of an ink room is decreased, and ink is made to breathe out in a period t13. Furthermore, the input of a pulse is suspended in a period t14, this condition is held, a downward pulse is inputted in a period t15, and regurgitation ink is divided. Then, while suspending the input of a pulse in a period t16 and carrying out fixed period maintenance of this condition, carriage is driven and the ink regurgitation sequence over the following dot is performed.

[0048] On the other hand, the voltage pattern of the drawing 4 bottom is the thing of a color system, in the ink of the color system concerned, inputs a lifting pulse in a period t21 first, and decreases the capacity of an ink room. And after falling and making the condition of ink attach by suspending the input of a pulse in a period t22, and holding a piezo-electric element, this condition is held in a period t24, it falls and the condition of ink is made to input a downward pulse, to make the capacity of an ink room increase, and to attach in a period t23. Furthermore, a lifting pulse is inputted again, the capacity of an ink room is decreased, and ink is made to breathe out in a period t25. This condition is held in next in a period t26, a downward pulse is inputted into it in a period t27, regurgitation ink is divided, this condition is held in a period t28, and the regurgitation sequence of 1 dot is ended.

[0049] Thus, in the ink of a pigment system, and the ink of a color system, head actuation patterns also differ from the difference in an ink property, in order to perform control suitable for each system, driver voltage is held according to the ink system, and according to the class of ink, it is referred to suitably. Besides the driver voltage at the time of this printing, it is generable [the head actuator 16 / the voltage for cleaning or Flushing], and an arm head 22 can perform the regurgitation of the ink which is unrelated to printing with the voltage concerned. That is, on the other hand, the pump unit 24 is arranged directly under the edge, and attraction of thickening ink and initial restoration processing to tube 22a can be performed by making negative pressure act to the arm head 22 of a reciprocating motion of an arm head 22 conveyed to this pump-unit location.

[0050] The head actuator 16 impresses predetermined driver voltage to a pump unit 24 through the cable which is not illustrated. If fixed time amount passes during printing, the Flushing conditions according to the class of ink will be referred to. An arm head 22 is made to perform the predetermined ink regurgitation, and while referring to the cleaning conditions according to an ink class according to the predetermined actuation in the above-mentioned manual operation button 32, predetermined cleaning actuation can be performed on an arm head 22. Furthermore, after exchange of an ink cartridge, initial restoration processing to tube 22a is performed.

[0051] Drawing 5 is the schematic diagram having shown the outline of the control which the printer control unit applied to this invention in the above-mentioned configuration carries out. In order for the above CPU 12 to bear the main control in the printer control unit and to perform processing according to the class of ink, CPU12 compares the ink mode memorized by the class and flash memory 14 of the ink memorized by the above-mentioned cartridge memory 43a. It prints in the condition of having made in agreement the class of ink in which under the current activity memorized as ink mode (i.e., an ink supply system) is filled up with ink, and the class of ink with which the ink cartridge 43 is filled up.

[0052] Moreover, since an arm head 22 is driven on the conditions which suited the class of ink it was presupposed that it was in agreement of ink with these comparisons, with reference to a flash memory 14, an arm head 22 is driven using the parameter of pigment system control or color system control according to the class of ink current in use. Furthermore, by updating it from the ink residue of the above-mentioned cartridge memory 43a, as the amount used concerned is reduced, while computing the amount of the ink used by multiplying the number of dots counted by ASIC13 by the counter coefficient according to the class of ink, even if it is pigment system ink and is color system ink, the ink residue is memorized to accuracy. Thus, in this operation gestalt, CPU12, ASIC13, the head actuator 16, and control IC41a constitute the

above-mentioned head actuation control means.
[0053] Drawing 6 -8 show the flow chart of the processing which CPU12 performs with an ink jet printer 10 including the above control. Drawing 6 is processing performed after boot of an ink jet printer 10, and CPU12 distinguishes whether the above-mentioned initial flag is ON with reference to a flash memory 14 at step S100. Processing for being filled up with ink in the tube 22a concerned is performed noting that ink supply systems, such as above-mentioned tube 22a, are not filled up with ink, when it is not distinguished at this step S100 that an initial flag is ON.
[0054] At this time, in step S105, CPU12 performs the above-mentioned control IC41a and a communication link, carries out reading appearance of the ink class of cartridge memory 43a to this control IC41a, and grasps the class of ink of six colors each. At step S110, it distinguishes whether the class of this read ink is the same class also as six colors, when it is not distinguished that it is the same class, the panel section 30 is controlled by step S115 through above-mentioned panel I/O33, and the error message A shown in the liquid crystal display object 31 at drawing 9 is displayed.
[0055] An error message A is a message "six colors of cartridges are not unified", and the processing after the above-mentioned step S105 is repeated, urging exchanging the ink cartridge 43 which the user was mistaken in and was inserted where the message concerned is displayed to a proper thing. When the class of ink is distinguished at the above-mentioned step S110 as it is the same class also as six colors, restoration processing of ink to an ink supply system is performed at step S120. The restoration processing concerned is a special sequence which makes an ink supply system fill up with ink, after this sequence is performed, an ink supply system is filled up with the ink in an ink cartridge, and the ink interior of a room of an arm head 22 is also filled up with ink. Therefore, if the piezo-electric element in an arm head 22 is driven in this condition, ink will be breathed out from the nozzle of an arm head 22.
[0056] After this restoration processing, the class of ink which accessed the above-mentioned flash memory 14 at step S125, and carried out [above-mentioned] restoration is set up as ink mode. Furthermore, the above-mentioned flash memory 14 is accessed at step S130, and the above-mentioned initial flag is set. When it is distinguished at the case where such restoration processing is performed, and the above-mentioned step S100 that an initial flag is ON, while accessing the above-mentioned flash memory 14 at step S135 and reading the above-mentioned ink mode, reading appearance of the ink class of cartridge memory 43a is carried out to the above-mentioned control IC41a at step S140, and the class of ink with which the ink cartridge 43 with which it is equipped was filled up is grasped.
[0057] And it distinguishes whether the ink mode memorized by the class and flash memory 14 of the ink filled up with step S145 into the ink cartridge 43 is in agreement. When both were in agreement at step S145 and it is distinguished, printing processing is performed at step S200. If both are in agreement at step S145, when not being distinguished, the panel section 30 is controlled by step S150 through above-mentioned panel I/O33, and the error message B shown in the liquid crystal display object 31 at drawing 10 is displayed.
[0058] An error message B is a message of "being equipped with the ink in which ink modes differ", and the processing after the above-mentioned step S140 is repeated, urging exchanging the ink cartridge 43 which the user was mistaken in and was inserted where the message concerned is displayed to a proper thing. Processing which is standing by and shows that print-data transmission is carried out with printing directions from the above-mentioned computer 50 in printing processing of step S200 to drawing 7 after printing directions is performed.
[0059] At step S205, the above ASIC 13 is accessed, a counter is cleared to "0" at the amount step S210 of the ink used in this ASIC13, reading appearance of the ink class of cartridge memory 43a is carried out to the above-mentioned control IC41a at step S210, and the class of ink with which the ink cartridge 43 with which it is equipped was filled up is grasped. And a flash memory 14 is accessed at step S215, and the printing conditions which suited the class of the ink concerned are read.
[0060] Printing is performed driving a part for a predetermined line based on the print data transmitted from the above-mentioned computer 50 after step S220. At step S220, with reference to the driver voltage of the printing conditions which suited the class of the above-

mentioned ink, a command is transmitted to the above ASIC 13, and an arm head 22 is driven by making the head actuator 16 output the above-mentioned pulse. Thus, an arm head 22 is driven, and at step S225, the count is performed by ASIC13, moving an arm head 22 by carriage and performing printing.

[0061] after printing for a predetermined line is completed, reading appearance of the counter coefficient which accessed the flash memory 14 at step S230, and suited the class of ink is carried out, and the amount of the ink used is computed by multiplying by the counter coefficient concerned which carried out reading appearance and the counted value of the above ASIC 13 at step S235. As the amount of the ink used which computed the command at this step S235 from delivery and the ink residue memorized at cartridge memory 43a is reduced to the above-mentioned control IC41a, it is made to update the ink residue concerned at step S240. In step S245, the above ASIC 13 is accessed and a counter is again cleared to "0" at the amount step S210 of the ink used in this ASIC13.

[0062] And the processing after the above-mentioned step S220 is repeated until it distinguishes that it was finished whether printing all the print data transmitted from the above-mentioned computer 50 in step S250 and having finished printing is distinguished. In addition, in one end position of a reciprocating motion according [the above-mentioned arm head 22] to carriage, Flushing is made with this operation gestalt. That is, after fixed time amount passes during printing, an arm head 22 is conveyed even to the Flushing field, and Flushing is performed, reading the Flushing conditions which suit the class of ink read from the flash memory 14 at the above-mentioned step S210. Moreover, when an ink cartridge 43 is removed in this operation gestalt, in order to prevent continuing performing printing, when the signal which control IC41a outputs when the above-mentioned ink cartridge 43 is removed is detected, processing which interrupts processing of steps S205-S250 of drawing 7 , and is shown in drawing 8 is performed.

[0063] If the signal which shows that the ink cartridge 43 was removed is detected, the panel section 30 will be controlled by step S305 through above-mentioned panel I/O33, and the error message C shown in the liquid crystal display object 31 at drawing 11 will be displayed. An error message C is a message "equip with a cartridge", and the processing after the above-mentioned step S305 is repeated until the signal which shows that it equipped with the ink cartridge 43 at step S310 is detected a user urging equipping with an ink cartridge 43 where the message concerned is displayed. If the signal which shows that it equipped with the ink cartridge 43 at step S310 is detected, while accessing the above-mentioned flash memory 14 at step S315 and reading the above-mentioned ink mode, reading appearance of the ink class of cartridge memory 43a is carried out to the above-mentioned control IC41a at step S320, and the class of ink with which the ink cartridge 43 with which it is equipped was filled up is grasped.

[0064] And it distinguishes whether the ink mode memorized by the class and flash memory 14 of the ink filled up with step S325 into the ink cartridge 43 is in agreement. If both are in agreement at step S325, when not being distinguished, the panel section 30 is controlled by step S330 through above-mentioned panel I/O33, and the error message B shown in the liquid crystal display object 31 at drawing 10 is displayed. when both were in agreement at step S325 and it is distinguished, reading appearance of the counter coefficient which accessed the flash memory 14 at step S325, and suited the class of ink is carried out, and the amount of the ink used is computed by multiplying by the counted value currently held at step S340 by the counter coefficient which carried out reading appearance and Above ASIC 13 concerned.

[0065] As the amount of the ink used which computed the command at this step S340 from delivery and the ink residue memorized at cartridge memory 43a is reduced to the above-mentioned control IC41a, it is made to update the ink residue concerned at step S345. That is, after the restoration ink of an ink cartridge 43 with which it is re-equipped judges whether it is the right, an ink residue is updated based on the counted value counted until the cartridge was extracted. Therefore, even if it is the case where an ink cartridge 43 is in the middle of printing, and is removed, it becomes a right ink residue. Then, it returns to the printing processing shown in above-mentioned drawing 7 .

[0066] Furthermore, in this operation gestalt, it is usable in the both sides of the ink of a pigment system, and the ink of a color system, and the class of the ink concerned can be changed. On

the occasion of exchange of an ink system, if the ink of both systems is mixed, in a print, it will not become suitable coloring, and various inconvenience arises from the actuation patterns of head 22 grade differing. Therefore, on the occasion of exchange of an ink system, it is necessary to also carry out washing of the above-mentioned ink supply system. When a user or a serviceman performs predetermined pushing actuation with the manual operation button 32 of the above-mentioned panel section 30, it is possible to carry out the message exchange of ink.
[0067] That is, if predetermined pushing actuation is performed in the above-mentioned manual operation button 32, the predetermined trigger according to the actuation concerned will be outputted, and if CPU12 receives the trigger concerned, even if printing will perform, the message exchange shown in step S400 of drawing 6 is performed. Expressing a predetermined guidance message on the liquid crystal display object 31 of the above-mentioned panel section 30 as step S410 in this message exchange, it is made to equip with the cartridge by which the penetrant remover went into the cartridge holder 42, and the washing sequence over an ink supply system is performed. Since the ink supply system of an ink jet printer 10 of after this washing processing is the same as that of an off, a new condition and a new EQC, i.e., an initial flag, condition, processing after the above-mentioned step S105 is performed.
[0068] Furthermore, if cleaning actuation which washes the arm head 22 other than the washing processing at the time of this ink system modification can be performed and predetermined pushing actuation is performed with the manual operation button 32 of the above-mentioned panel section 30 If the predetermined trigger according to the actuation concerned is outputted and CPU12 receives the trigger concerned The wiping member which CPU12 becomes from elastic plates, such as rubber, after it discharges directions by delivery and it makes the head actuator 16 discharge ink with negative pressure through the above ASIC 13 performs wiping actuation on the front face of head.
[0069] Hereafter, the example of operation performed with this operation gestalt by the above-mentioned configuration and the processing flow is explained. Drawing 12 shows the signal outputted when the content and cartridge in ink mode which are memorized by the class and flash memory 14 of the ink with which it filled up in each ink cartridge 43 are removed, and the counted value in ASIC13 by the timing chart. Suppose that the ink cartridge of the ink of a pigment system, yellow (Y), and a light Magenta (LM) is filled up with the ink of a color system at the ink cartridge of cyanogen (C), a Magenta (M), black (K), and light cyanogen (LC) as an initial state in this example of operation.
[0070] In this condition, if an ink jet printer 10 is booted, processing shown in above-mentioned drawing 6 is performed, and it distinguishes whether an initial flag is ON at step S100, and read-out of the ink class in step S105 and distinction in step S110 will be performed noting that an initial flag is not ON. Here, since the thing of a pigment system and the thing of a color system are intermingled, the ink with which the ink cartridge is filled up displays an error message A on the liquid crystal display object 31 in step S115 through distinction of step S110.
[0071] A user grasps that the class of ink is intermingled by checking this error message A by looking, and he equips with the ink cartridge of the yellow with which the ink of a pigment system was filled up, and a light Magenta while he removes the ink cartridge of the above-mentioned yellow and a light Magenta at time of day t1. Consequently, it will distinguish, if the ink of the same class is filled up with step S110 into all ink cartridges, initial restoration to an ink supply system is performed at step S120, and while setting ink mode as a flash memory 14 as a pigment system at step S125, an initial flag is set at step S130.
[0072] Furthermore, the class of ink may be mistaken, when the initial flag is turned on and an ink jet printer 10 is conveyed, and an ink cartridge 43 is once removed and it equips with it again. For example, suppose that it equipped with the ink cartridge 43 into which the ink of a color system was filled up with time of day t2, and the ink jet printer 10 was booted after carrying out the above-mentioned initial restoration.
[0073] In this case, if the initial flag is turned on at step S100, after distinguishing, the purport whose ink mode memorized by the flash memory 14 at step S135 is a pigment system is grasped, the class of ink memorized by cartridge memory 43a at step S140 is read, and the purport which is a color system is grasped. As a result, at step S145, it will be distinguished if both are not in

agreement, and an error message B is displayed on the liquid crystal display object 31.
[0074] By checking this error message B by looking, a user grasps having mistaken the class of ink and reequips with the ink cartridge 43 into which the ink of a pigment system was filled up with time of day t3. Consequently, it will be distinguished if ink mode and the ink class of ink cartridge with which it is equipped are in agreement at step S145, and printing processing of step S200 is performed. If printing processing is started, the counted value of the amount counter of the ink used of the above ASIC 13 will be cleared by "0" at step S205, a flash memory 14 will be referred to at step S210, and the purport by which ink mode is set as the pigment system will be grasped.
[0075] CPU12 reads the printing conditions which suit the pigment system concerned at step S215 with reference to a flash memory 14 further, and performs printing by the processing after step S220. At this time, the above-mentioned counted value of ASIC13 increases with printing activation. If printing is continued as it is, it will result in printing termination soon, but when a user removes an ink cartridge 43 (this example light Magenta) by a certain reason in the time of day t4 before resulting in printing termination, the above-mentioned control IC41a outputs the signal of a purport with which the ink cartridge was removed.
[0076] Consequently, the printing processing which CPU12 was performing is interrupted and the flow of drawing 8 is performed. That is, an error message C is displayed on the liquid crystal display object 31 at step S305, and when a user checks this error message C by looking, it urges reequipping with an ink cartridge 43. If a user equips with an ink cartridge 43, processing after step S315 will be performed through distinction of step S310, but when it equips with the ink cartridge 43 with which the ink of a color system which is different from other ink cartridges 43 at time of day t5 accidentally was filled up, an error message B is further displayed by processing of step S315 - step S330.
[0077] If it changes into the suitable cartridge by which the ink cartridge 43 was filled up with time of day t6 into pigment system ink when a user checked the error message concerned by looking, a flash memory 14 will be accessed at step S335 through distinction of step S325, and the counter coefficient of a pigment system will be read. And by multiplying the counted value counted till the above-mentioned time of day t4 at step S340 by the counter coefficient concerned, the amount of the ink used is computed and cartridge memory 43a is updated through the above-mentioned control IC41a at step S345. That is, since an ink residue is updated when it equips with the again proper ink cartridge 43, while the counted value till then is held even if an ink cartridge 43 is removed in the middle of printing, the ink residue memorized by cartridge memory 43a will become proper.
[0078] Thus, in this invention, the class of ink memorized by the class and the above-mentioned nonvolatile memory of the ink which memorized the class of ink and the residue of ink to the nonvolatile memory carried in the ink cartridge, memorized the class of the ink when supplying ink to the ink supply system, and was said-memorized at the time of printing is compared. Consequently, when both are in agreement, printing control which suited the class of the ink concerned can be performed, and mixing of ink can be prevented. Moreover, the amount of the ink used is computed according to head actuation, and since the residue of ink is updated, a proper ink residue can be judged.

[Translation done.]

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] The following technical problems occurred in the conventional ink jet printer mentioned above. That is, wearing of the ink cartridge of a class which makes a mistake in two kinds of ink, and is different before carrying out exchange and washing of an ink supply system also in an usable printer will mix the ink of a different system inside an ink supply system. Since it becomes impossible to perform discharge quantity control according to the property of ink etc. when two kinds of ink has been mixed, printing quality is spoiled. Therefore, in order to exchange the two above-mentioned kinds of ink and to prevent mixing of the ink in an ink supply system in an usable ink jet printer, exchange and washing of an ink supply system are needed at the time of exchange of an ink class.
[0004] Furthermore, although the residue of the ink with which the ink cartridge is filled up in the ink jet printer may be supervised and it may display as the status Before exhausting ink in the conventional ink jet printer mentioned above, from an exchangeable thing, an ink cartridge in pigment system ink and color system ink When the class of ink was changed and the class of ink was returned further once again after using ink to the middle, there was a problem that the ink residue of the original cartridge could not be judged correctly.
[0005] This invention was made in view of the above-mentioned technical problem, and even if it changes an ink cartridge what times, it aims at offering the printer control unit which can judge an ink residue correctly, the printer control method, and a printer control unit, while carrying out proper control according to an ink class, preventing mixing of the ink of a different system in the printer which can exchange an ink class.

[Translation done.]

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MEANS

[Means for Solving the Problem] Invention which starts claim 1 in order to attain the above-mentioned object is constituted so that a printer which prints while supplying ink with which an exchangeable ink cartridge was filled up to an arm head may be controlled, and it is controlled, preventing mixing of an ink class. For this reason, nonvolatile memory which can update the content of storage is carried in an exchangeable ink cartridge, and a class of ink with which an ink cartridge is filled up is memorized by this nonvolatile memory. This ink cartridge is detached and attached through an ink cartridge applied part by main part of a printer, and data transmission and reception from the above-mentioned nonvolatile memory are possible for it at the time of wearing.
[0007] Furthermore, a class of ink currently supplied to an ink supply system which consists of ink supply tubes from an ink cartridge to an arm head etc. is memorized by supply ink storage means, and printing conditions required for actuation of an arm head are memorized by printing condition storage means according to a class of ink. A head actuation control means uses such storage information in printing, and compares a class of ink memorized by a class of ink and the above-mentioned supply ink storage means which were memorized by nonvolatile memory. And actuation of an arm head is controlled based on printing conditions which drive an arm head in the condition that a class of both ink is in agreement, and suit this ink class in agreement.
[0008] Namely, a class of ink memorized by the above-mentioned nonvolatile memory is uniquely in agreement with a class of ink with which an ink cartridge was filled up. Since a class of ink memorized by supply ink storage means is uniquely in agreement with a class of ink currently supplied to an ink supply system When a head actuation control means compares these, it can prevent driving an arm head using an ink cartridge of a class of different ink from a class of ink already supplied to an ink supply system, and mixing of ink can be prevented.
[0009] Here, updating of the content of storage is possible for it, and if the above-mentioned nonvolatile memory is nonvolatile, can adopt good various modes and is constituted from EEPROMs, such as a flash memory, it is suitable. Moreover, although what is necessary is just to memorize whether a class of ink is the thing of whether restoration ink is the thing of a color system as information which is used in order to prevent mixing of ink as mentioned above, and for that shows a class of ink, and a pigment system, it is possible to memorize various information in addition to this as a class of ink. That is, by referring to the restoration day concerned, if a restoration day of ink is memorized, it can constitute so that ink over which the expiration date passed may not be used. Moreover, even if it is ink of a same system, actuation of an arm head is controllable by the best actuation sequence over the ink by memorizing information which shows a purport from which a component differs.
[0010] It is removable in an ink cartridge, and the ink cartridge attachment-and-detachment section equips a holder of a fitting type with a container which has capacity which can be filled up with ink that what is necessary is just to be able to enable data transmission and reception from nonvolatile memory at the time of ink cartridge wearing, and a configuration which secures a flow of a terminal of nonvolatile memory to fitting concerned and coincidence is possible for it. It can constitute from rewritable various memory that what is necessary is just to be able to memorize a class of ink currently supplied to an ink supply system in a supply ink storage means.

Although RAM etc. can constitute, if a printer is frequently constituted from EEPROMs, such as a flash memory, a place whose power supply is what is turned on / turned off, it is suitable.
[0011] It can constitute from various memory that what is necessary is just to be able to memorize according to a class of ink filled up with printing conditions required for actuation of an arm head by the above-mentioned ink cartridge in a printing condition storage means. Although a mask ROM etc. can also constitute, the status changes with activities serially, and since it is the mode which can change activity ink, if especially this invention is constituted from EEPROMs, such as a rewritable flash memory, it is suitable [this invention] for a printer. If a head control driving means is constituted from a CPU etc., it is [that what is necessary is to read and calculate information from various memory etc. and just to be able to control memory, an arm head, etc.] suitable.
[0012] As a configuration for controlling to be able to judge an ink residue correctly, furthermore, invention according to claim 2 In a printer control unit given in above-mentioned claim 1 the above-mentioned nonvolatile memory A residue of ink with which an ink cartridge is filled up is memorized, and the above-mentioned head actuation control means is considered as a configuration which updates a residue of ink memorized by the above-mentioned nonvolatile memory based on the calculation concerned while it computes the amount of ink used consumed with actuation of the above-mentioned arm head.
[0013] That is, since a residue of ink is updated with actuation of a printer, it becomes the residue of proper ink. Since a residue of ink is memorized by nonvolatile memory carried in the ink cartridge itself, it removes, before consuming ink with which it filled up, other ink cartridges are used, and an ink residue will become proper even if it uses an ink cartridge removed again. of course -- even if it uses it, removing an ink cartridge and making other printers equip -- being concerned -- others -- if a printer control unit which requires a printer for this invention is provided, it will become a proper ink residue.
[0014] Moreover, the technique of computing the amount of ink used by head actuation control means is various, and invention according to claim 3 is considered as a configuration which computes the amount of the ink used based on a counter which the above-mentioned head actuation control means increases with actuation of the above-mentioned arm head in a printer control unit given in above-mentioned claim 2 as an example of a configuration for it. That is, since an arm head drives at the time of printing, if a counter which counted value increases with actuation of the arm head concerned is used, based on the counted value concerned, the amount used is easily computable. The technique of more specifically counting the number of dots which carries out the regurgitation by arm head is employable. What is necessary is just to compute the amount used for every class of ink based on the number of dots, although the amount used may change with classes of ink also with the same number of dots since a class of ink can be changed in this invention. Thus, when computing the amount of ink used based on counted value, especially this count should just form a single counter, without distinguishing according to a class of ink.
[0015] As an example of printing conditions which various conditions exist as printing conditions required for actuation of the above-mentioned arm head, and need to be memorized according to a class of ink, furthermore, invention according to claim 4 In a printer control unit given in above-mentioned claim 3, the above-mentioned printing condition storage means is considered as a configuration which memorizes the amount calculation coefficient of the ink used for computing the amount of the ink used by taking an advantage at counted value of the above-mentioned counter.
[0016] That is, since above-mentioned counted value and the amount of ink used are usually in proportionality, if the amount calculation coefficient of the ink used which computes the amount of the ink used by taking the advantage of counted value is prepared, the amount used can be easily obtained from counted value only by 1 time of multiplication. Moreover, it can constitute very easily [that the amount coefficient of the ink used for every class of ink may only be memorized], and in order to compute the amount used for every class of ink, also when it is necessary to correspond to ink in which a class of ink increases or properties differ, it can respond easily.

[0017] Furthermore, invention according to claim 5 is considered as a configuration which memorizes a driver voltage pattern impressed in case the above-mentioned printing condition storage means drives the above-mentioned arm head in a printer control unit given in either above-mentioned claim 1 - claim 4 as other examples of printing conditions which need to be memorized according to a class of ink. That is, when classes of ink differ like ink of a pigment system, and ink of a color system, conditions which drive an arm head differ. For example, if the above-mentioned ink classes differ in the case of a printer which controls discharge quantity, regurgitation timing, etc. of ink by telescopic motion of a piezo-electric element etc., 1 time of ink discharge quantity differs from regurgitation timing etc. Since it is controlled by changing a driver voltage pattern impressed to an arm head, such discharge quantity etc. can perform printing according to a class of ink easily, if a driver voltage pattern is memorized according to a class of ink as printing conditions.

[0018] Furthermore, invention according to claim 6 is considered as a configuration which memorizes actuation conditions which the above-mentioned printing condition storage means needs for cleaning of an ink supply system in the above-mentioned arm head in a printer control unit given in either above-mentioned claim 1 - claim 5 as other examples of printing conditions which need to be memorized according to a class of ink. Namely, since an ink supply system may be cleaned, ink is once discharged in this case and wiping etc. is carried out when a case where a printer is not used for a long time, and printing quality have deteriorated, in order to make blowdown perform exactly, it is necessary to drive an arm head a condition for every class of ink, and, in such a case, can respond.

[0019] Furthermore, since a class of ink can be exchanged in this invention, it is necessary to also wash an ink supply system from a cartridge to an arm head on the occasion of exchange, and when performing this washing sequence, in order to make ink of an ink supply system discharge exactly, it is necessary to drive an arm head a condition for every class of ink, and, also in such a case, can respond.

[0020] Furthermore, invention according to claim 7 is considered as a configuration which memorizes actuation conditions which the above-mentioned printing condition storage means needs for Flushing in the above-mentioned arm head in a printer control unit given in either above-mentioned claim 1 - claim 6 as other examples of printing conditions which need to be memorized according to a class of ink. Namely, although Flushing may be performed in order to carry out regurgitation blowdown of the color mixture ink which flowed backwards from a nozzle by wiping or to prevent blinding by thickening of ink, from it being what should be determined with the property of an ink class, timing which performs this Flushing, and a regurgitation discharge at the time of Flushing need to drive an arm head a condition for every class of ink, in order to perform Flushing exactly, and, in such a case, can respond.

[0021] Furthermore, when a power supply of a printer is turned off suddenly, mixing of ink is prevented after re-powering on. As an example for judging an ink residue appropriately and constituting it possible [activation of head actuation for every class of ink] exactly, invention according to claim 8 In a printer control unit given in either above-mentioned claim 1 - claim 7, either or combination of the above-mentioned nonvolatile memory, a supply ink storage means, and a printing condition storage means is considered as a configuration which can be set up so that a store and elimination of storage information may be forbidden.

[0022] That is, if a store and elimination of storage information can be forbidden, when a case where a power supply was turned off suddenly and a power supply becomes instability, and a noise increase, required storage information is not updated and a printer can be driven in the original condition after re-powering on. For example, since storage information on a supply ink storage means is still origin, in spite of having already supplied ink after re-powering on at an ink supply system, it is going to perform supply of further different ink and ink is not mixed. Moreover, an arm head is not driven using ink currently supplied to an ink supply system, and different ink. Furthermore, when a power supply becomes instability, information for computing the above-mentioned amount of the ink used is memorized for a printing condition storage means etc., and if an ink residue is updated based on the memorized amount of the ink used concerned after a power supply is stable, a more exact ink residue can be obtained. Here, as a

flume which forbids a store and elimination of storage information, when storage information needs to be updated of course, it updates by canceling a prohibition condition of a store and elimination.

[0023] Furthermore, invention according to claim 9 is considered as a configuration in which the above-mentioned head actuation control means performs a comparison of a class of the above-mentioned ink at the time of exchange of the above-mentioned ink cartridge in a printer control unit given in either above-mentioned claim 1 - claim 8 as an example of a configuration for controlling to prevent mixing of ink in the above-mentioned head actuation control means. That is, a printer concerning this invention is considered [mistaking a class of ink in many cases at the time of this exchange since it is exchangeable, and] in an ink cartridge, and can prevent mixing of ink certainly by performing the above-mentioned comparison at the time of this exchange. It constitutes so that various modes can be adopted in order to detect exchange of an ink cartridge here, for example, it may remove with the time of wearing of an ink cartridge and a predetermined signal may sometimes be outputted, and when a signal which shows wearing is detected, it can constitute so that a comparison may be performed.

[0024] Furthermore, invention according to claim 10 has considered [as an example of the configuration for preventing mixing of ink in the above-mentioned head actuation control means] as the configuration which updates at a class of the supplied ink concerned in a class of ink memorized by the above-mentioned supply ink storage means in a printer control unit given in either above-mentioned claim 1 - claim 9, after the above-mentioned head actuation control means supplies ink to the above-mentioned ink supply system.

[0025] That is, since a printer concerning this invention can change suitably a class of ink used by exchange of a cartridge, in case it changes a class of the ink concerned, it will also wash ink currently supplied to the above-mentioned ink supply system, and will newly be resupplied. Then, if a class of ink memorized by supply ink storage means by head actuation control means after supply of ink to an ink supply system is updated, an arm head can be driven using always proper ink by the comparison of a class of the above-mentioned ink, even if it carries out the message exchange of ink what times, and mixing of ink can be prevented.

[0026] Thus, while memorizing a class of ink, and a residue of ink to nonvolatile memory carried in an ink cartridge and preventing mixing of ink with reference to these, the technique of grasping a residue of ink proper does not necessarily need to be restricted to equipment with substance, and functioning also as the method can be understood easily. For this reason, invention concerning claim 11 - claim 20 is considered as a configuration corresponding to a control method which said printer control unit enforces. That is, there is no difference not only in equipment which not necessarily has substance but in being effective as the method.

[0027] By the way, such a printer control unit contains not only this but various kinds of modes as thought of that it may be used in the condition of existing independently and having been included in a certain device, and invention. Therefore, it can change suitably that it is software or hardware etc. When becoming the software of a printer control unit as an example of embodiment of thought of invention, naturally it exists on a record medium which recorded this software, and it must be said that it is used. Invention which starts claim 21 - claim 30 in the semantics is considered as a configuration corresponding to each step which makes said printer control unit carry out by computer.

[0028] of course, the record medium may be magnetic-recording data medium, may be magneto-optic-recording data medium, and can completely be considered the same way in any record media developed from now on. Moreover, about duplicate phases, such as a primary replica and a secondary replica, it is equivalent without room to completely ask. If above-mentioned data medium is the case where it carries out as the supply method using a communication line although it differs, a communication line serves as a transmission medium and this invention will be used.

[0029] Furthermore, a part is software, when a part is realized by hardware, there is nothing that is completely different in thought of invention, and it may be made into a thing of a gestalt which memorizes a part on a record medium and is read suitably if needed. Moreover, when carrying out this invention by software, it not only realizes as data medium by which invention recorded a

program, but naturally this invention is realized as the program itself, and the program itself is included in this invention.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the outline perspective diagram showing the internal configuration of an ink jet printer.
[Drawing 2] It is the block diagram of an ink jet printer.
[Drawing 3] It is drawing showing the important section of the memory map of a flash memory.
[Drawing 4] It is drawing showing the pattern of the applied voltage generated in a head actuator.

[Drawing 5] It is the schematic diagram having shown the outline of the control which a printer control unit carries out.
[Drawing 6] It is the flow chart of the processing which CPU performs.
[Drawing 7] It is the flow chart of the processing which CPU performs.
[Drawing 8] It is the flow chart of the processing which CPU performs.
[Drawing 9] It is drawing showing the example of a display of an error message.
[Drawing 10] It is drawing showing the example of a display of an error message.
[Drawing 11] It is drawing showing the example of a display of an error message.
[Drawing 12] It is the timing chart which shows actuation of each part.
[Description of Notations]
10 -- Ink jet printer
11 -- Maine substrate
12 -- CPU
13 -- ASIC
14 -- Flash memory
16 -- Head actuator
20 -- Printing section
21 -- Roller
22 -- Arm head
22a -- Tube
30 -- Panel section
31 -- Liquid crystal display object
32 -- Manual operation button
40 -- Cartridge section
41 -- Sub substrate
41a -- Control IC
42 -- Cartridge holder
43 -- Ink cartridge
43a -- Cartridge memory
50 -- Personal computer

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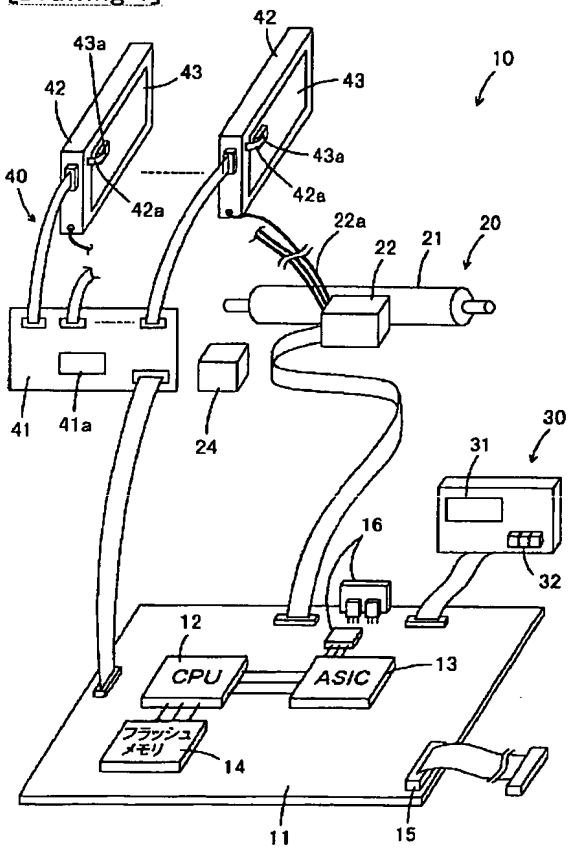
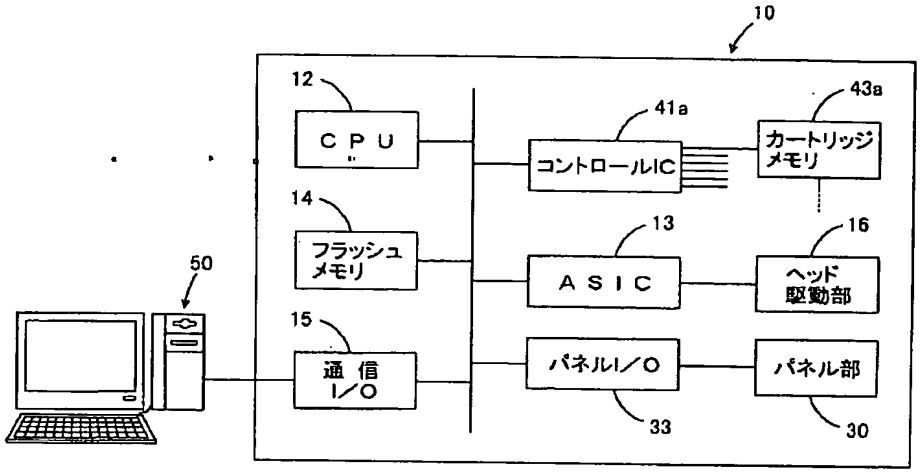
DRAWINGS

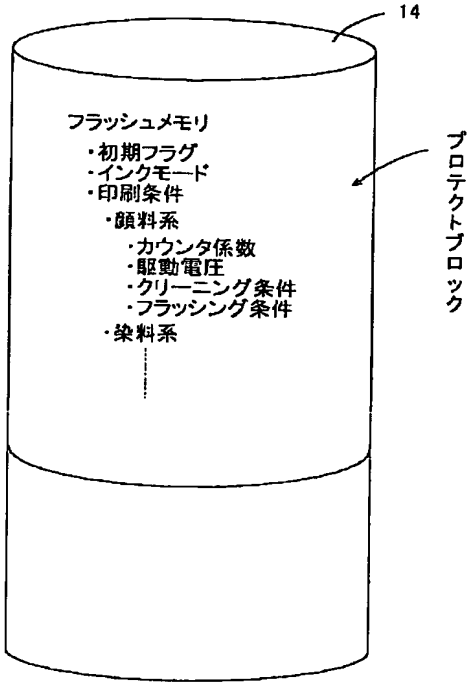
[Drawing 1]



[Drawing 2]



[Drawing 3]



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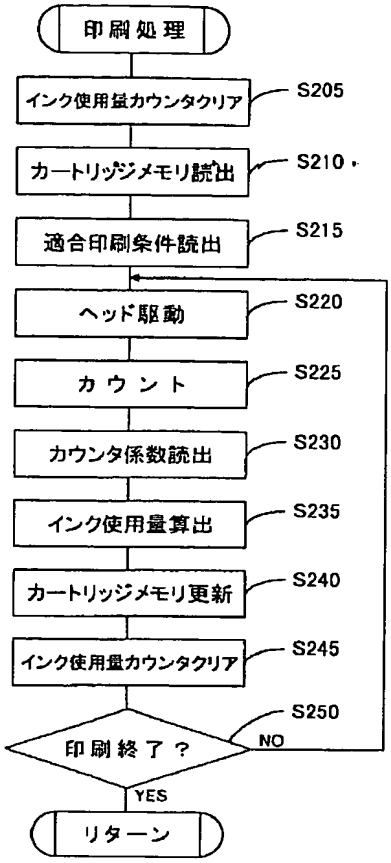

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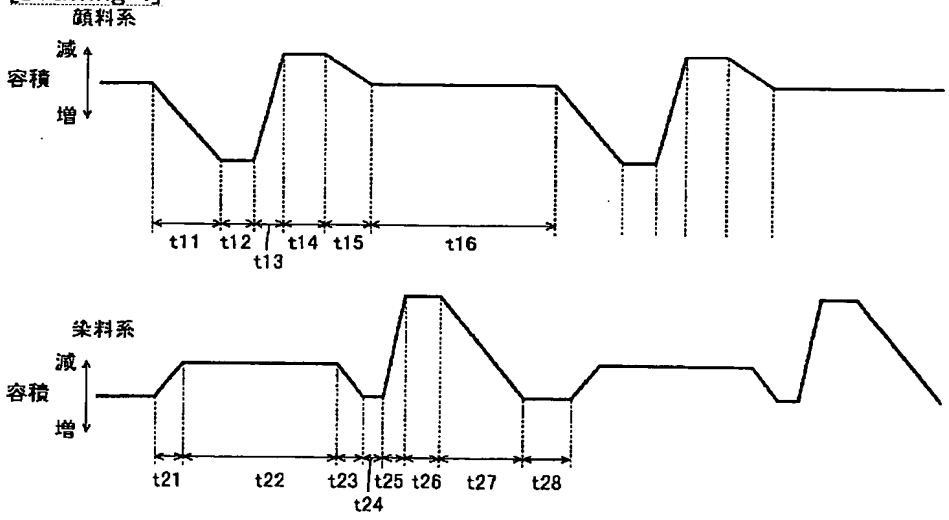
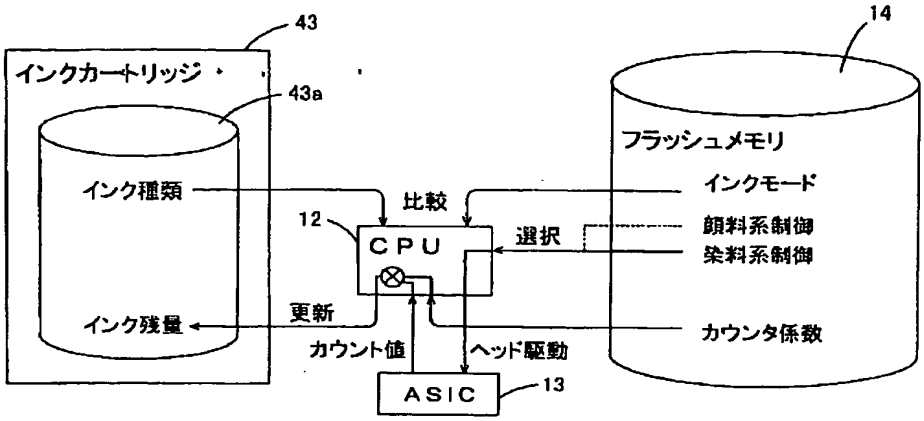
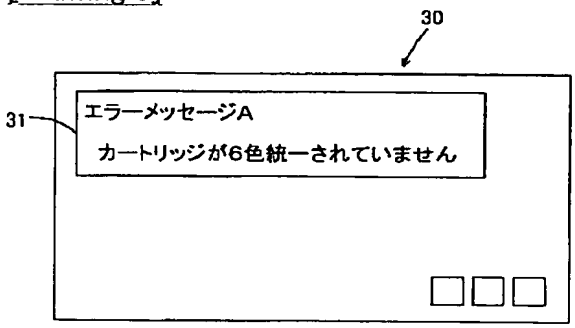


[Drawing 5]

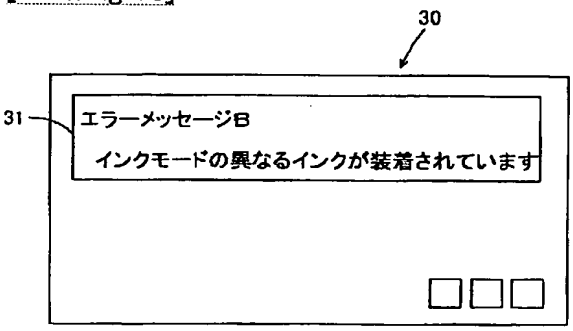
43a…カートリッジメモリ



[Drawing 9]



[Drawing 10]



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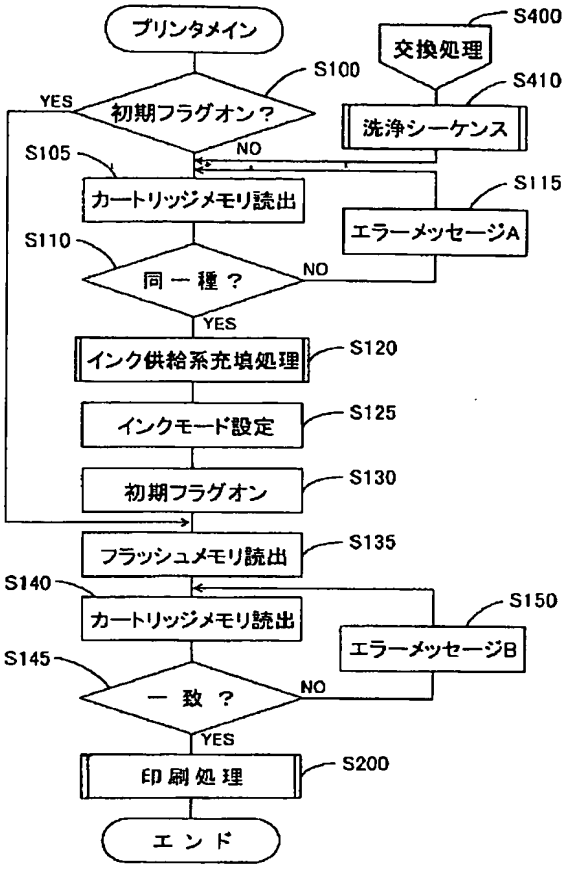

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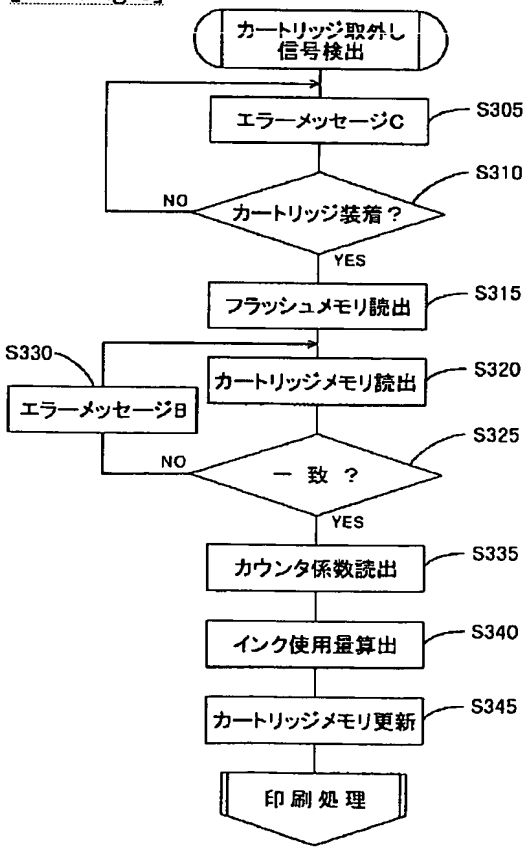
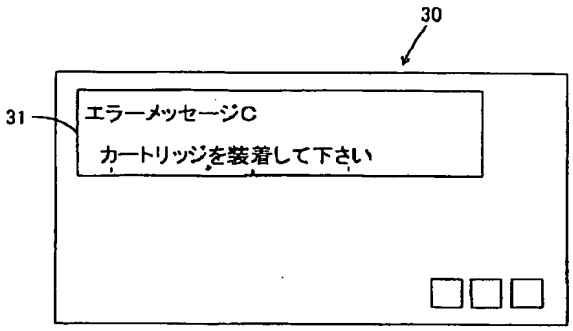
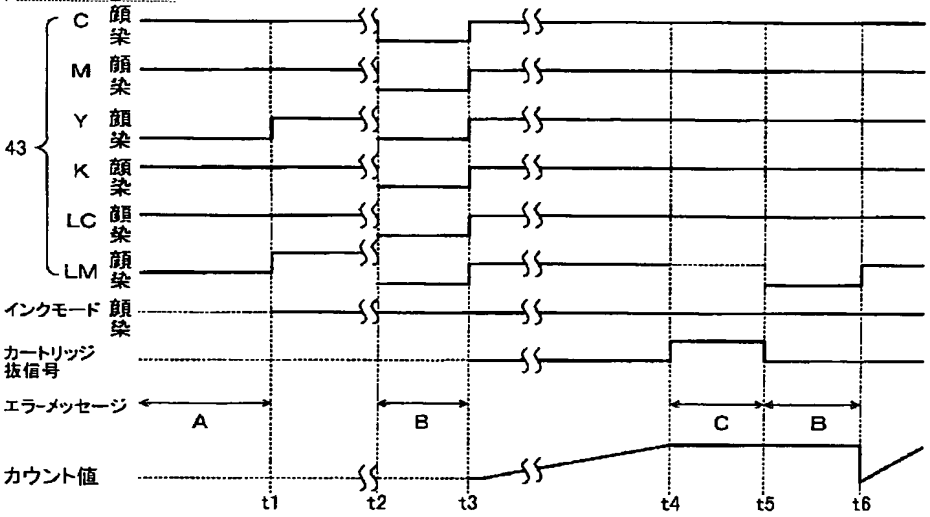


[Drawing 11]



[Drawing 12]



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2/175		3/04	102Z	2C061

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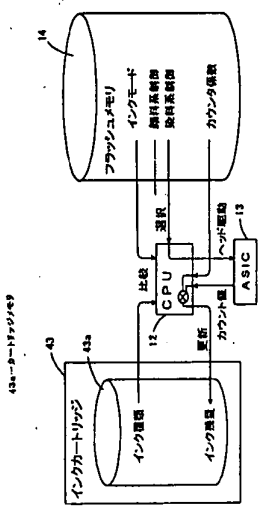
最終頁に続く

(54)【発明の名称】プリンタ制御装置、プリンタ制御方法およびプリンタ制御プログラムを記録した媒体

(57)【要約】
【課題】　インクカートリッジの交換によってインクの種類を変更可能なプリンタにおいて、異系統のインクが混合すると印刷品質が損なわれる。また、インクの残量を適正に判定することができなかった。
【解決手段】　インクカートリッジに搭載された不揮発性メモリにインクの種類やインクの残量を記憶し、インク供給系にインクを供給したらそのインクの種類を記憶し、印刷時に同記憶したインクの種類と上記不揮発性メモリに記憶されたインクの種類を比較する。この結果、両者が一致するときに当該インクの種類に適合した印刷制御を実行することができ、両者が一致しないときにはインクの混合を防止することができる。また、ヘッド駆動に応じてインク使用量を算出し、インクの残量を更新するので適正なインク残量を判定することができる。



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【特許請求の範囲】
【請求項１】　交換可能なインクカートリッジに充填されたインクをヘッドに供給しながら印刷を行うプリンタを制御するプリンタ制御装置であって、
記憶内容を更新可能であって上記インクカートリッジに搭載されるとともに当該インクカートリッジに充填されるインクの種類を記憶する不揮発性メモリと、
上記インクカートリッジを着脱可能であるとともに同インクカートリッジ装着時に上記不揮発性メモリからのデータ送受信を可能にするインクカートリッジ着脱部と、
上記インクカートリッジから上記ヘッドへのインク供給系に供給されているインクの種類を記憶する供給インク記憶手段と、
上記印刷にあたり上記ヘッドの駆動に必要な印刷条件を上記インクカートリッジに充填されるインクの種類別に記憶する印刷条件記憶手段と、
上記不揮発性メモリに記憶されたインクの種類と上記供給インク記憶手段に記憶されたインクの種類とを比較して、両者のインクの種類が一致する状態で上記印刷条件記憶手段に記憶された印刷条件に基づいてヘッドの駆動を制御しつつ適宜所定の情報を上記不揮発性メモリに書き込むヘッド駆動制御手段とを具備することを特徴とするプリンタ制御装置。
【請求項２】　上記請求項１に記載のプリンタ制御装置において、
上記不揮発性メモリは、インクカートリッジに充填されるインクの残量を記憶しており、上記ヘッド駆動制御手段は、上記ヘッドの駆動に伴って消費するインクの使用量を算出するとともに当該算出に基づいて上記不揮発性メモリに記憶されたインクの残量を更新することを特徴とするプリンタ制御装置。
【請求項３】　上記請求項２に記載のプリンタ制御装置において、
上記ヘッド駆動制御手段は、上記ヘッドの駆動とともに増加するカウンタに基づいてインク使用量を算出することを特徴とするプリンタ制御装置。
【請求項４】　上記請求項３に記載のプリンタ制御装置において、
上記印刷条件記憶手段は、上記カウンタのカウント値に乗ずることによってインク使用量を算出するためのインク使用量算出係数を記憶することを特徴とするプリンタ制御装置。
【請求項５】　上記請求項１～請求項４のいずれかに記載のプリンタ制御装置において、
上記印刷条件記憶手段は、上記ヘッドを駆動する際に印加する駆動電圧パターンを記憶することを特徴とするプリンタ制御装置。
【請求項６】　上記請求項１～請求項５のいずれかに記載のプリンタ制御装置において、
上記印刷条件記憶手段は、上記ヘッドにおけるインク供給系のクリーニングに必要な駆動条件を記憶することを特徴とするプリンタ制御装置。
【請求項７】　上記請求項１～請求項６のいずれかに記載のプリンタ制御装置において、
上記印刷条件記憶手段は、上記ヘッドにおけるフラッシングに必要な駆動条件を記憶することを特徴とするプリンタ制御装置。
【請求項８】　上記請求項１～請求項７のいずれかに記載のプリンタ制御装置において、
上記不揮発性メモリと供給インク記憶手段と印刷条件記憶手段とのいずれかまたは組み合わせは、記憶情報の書込と消去とを禁止するよう設定可能であることを特徴とするプリンタ制御装置。
【請求項９】　上記請求項１～請求項８のいずれかに記載のプリンタ制御装置において、
上記ヘッド駆動制御手段は、上記インクカートリッジの交換時に上記インクの種類の比較を実行することを特徴とするプリンタ制御装置。
【請求項１０】　上記請求項１～請求項９のいずれかに記載のプリンタ制御装置において、
上記ヘッド駆動制御手段は、上記インク供給系にインクを供給した後に上記供給インク記憶手段に記憶されるインクの種類を当該供給したインクの種類で更新することを特徴とするプリンタ制御装置。
【請求項１１】　記憶内容を更新可能であって充填されるインクの種類を記憶する不揮発性メモリを搭載するとともに装着部に着脱することによって交換可能なインクカートリッジに充填されたインクをヘッドに供給しながら印刷を行うプリンタを制御するプリンタ制御方法であって、
上記インクカートリッジから上記ヘッドへのインク供給系に供給されているインクの種類を記憶する供給インク記憶工程と、
上記印刷にあたり上記ヘッドの駆動に必要な印刷条件を上記インクカートリッジに充填されるインクの種類別に記憶する印刷条件記憶工程と、
上記不揮発性メモリに記憶されたインクの種類と上記供給インク記憶工程に記憶されたインクの種類とを比較して、両者のインクの種類が一致する状態で上記印刷条件記憶工程に記憶された印刷条件に基づいてヘッドの駆動を制御しつつ適宜所定の情報を上記不揮発性メモリに書き込むヘッド駆動制御工程とを具備することを特徴とするプリンタ制御方法。
【請求項１２】　上記請求項１１に記載のプリンタ制御方法において、
上記不揮発性メモリにインクカートリッジに充填されるインクの残量を記憶しておき、上記ヘッド駆動制御工程では、上記ヘッドの駆動に伴って消費するインクの使用量を算出するとともに当該算出に基づいて上記不揮発性メモリに記憶されたインクの残量を更新することを特徴

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とするプリンタ制御方法。

【請求項１３】　上記請求項１２に記載のプリンタ制御方法において、

上記ヘッド駆動制御工程では、上記ヘッドの駆動とともに増加するカウンタに基づいてインク使用量を算出することを特徴とするプリンタ制御方法。

【請求項１４】　上記請求項１３に記載のプリンタ制御方法において、

上記印刷条件記憶工程では、上記カウンタのカウント値に乗ずることによってインク使用量を算出するためのインク使用量算出係数を記憶することを特徴とするプリンタ制御方法。

【請求項１５】　上記請求項１１～請求項１４のいずれかに記載のプリンタ制御方法において、

上記印刷条件記憶工程では、上記ヘッドを駆動する際に印加する駆動電圧パターンを記憶することを特徴とするプリンタ制御方法。

【請求項１６】　上記請求項１１～請求項１５のいずれかに記載のプリンタ制御方法において、

上記印刷条件記憶工程では、上記ヘッドにおけるインク供給系のクリーニングに必要な駆動条件を記憶することを特徴とするプリンタ制御方法。

【請求項１７】　上記請求項１１～請求項１６のいずれかに記載のプリンタ制御方法において、

上記印刷条件記憶工程では、上記ヘッドにおけるフラッシングに必要な駆動条件を記憶することを特徴とするプリンタ制御方法。

【請求項１８】　上記請求項１１～請求項１７のいずれかに記載のプリンタ制御方法において、

上記不揮発性メモリと供給インク記憶工程と印刷条件記憶工程とのいずれかまたは組み合わせは、記憶情報の書込と消去とを禁止するよう設定可能であることを特徴とするプリンタ制御方法。

【請求項１９】　上記請求項１１～請求項１８のいずれかに記載のプリンタ制御方法において、

上記ヘッド駆動制御工程では、上記インクカートリッジの交換時に上記インクの種類の比較を実行することを特徴とするプリンタ制御方法。

【請求項２０】　上記請求項１１～請求項１９のいずれかに記載のプリンタ制御方法において、

上記ヘッド駆動制御工程では、上記インク供給系にインクを供給した後に上記供給インク記憶工程にて記憶されたインクの種類を当該供給したインクの種類で更新することを特徴とするプリンタ制御方法。

【請求項２１】　記憶内容を更新可能であって充填されるインクの種類を記憶する不揮発性メモリを搭載するとともに装着部に着脱することによって交換可能なインクカートリッジに充填されたインクをヘッドに供給しながら印刷を行うプリンタをコンピュータにて制御するためのプリンタ制御プログラムを記録した媒体であって、

上記インクカートリッジの不揮発性メモリに記憶されたインクの種類を読み出してインクカートリッジ内のインクの種類を判定する機能と、

上記プリンタ本体に搭載された不揮発性メモリに対して予め記載されている当該プリンタが使用中のインクの種類を読み出す機能と、

判定された上記インクカートリッジのインクの種類と上記読み出されたインクの種類とを比較するとともに、両者のインクの種類が一致する場合には上記プリンタ本体に搭載された不揮発性メモリにてインクの種類別に記憶された印刷条件を読み出して上記ヘッドの駆動を制御しつつ適宜所定の情報を上記インクカートリッジの不揮発性メモリに書き込むヘッド駆動制御機能とをコンピュータに実行させることを特徴とするプリンタ制御プログラムを記録した媒体。

【請求項２２】　上記請求項２１に記載のプリンタ制御プログラムを記録した媒体において、

上記不揮発性メモリは、インクカートリッジに充填されるインクの残量を記憶しており、上記ヘッド駆動制御機能では、上記ヘッドの駆動に伴って消費するインクの使用量を算出するとともに当該算出に基づいて上記不揮発性メモリに記憶されたインクの残量を更新させることを特徴とするプリンタ制御プログラムを記録した媒体。

【請求項２３】　上記請求項２２に記載のプリンタ制御プログラムを記録した媒体において、

上記ヘッド駆動制御機能では、上記ヘッドの駆動とともに増加するカウンタに基づいてインク使用量を算出することを特徴とするプリンタ制御プログラムを記録した媒体。

【請求項２４】　上記請求項２３に記載のプリンタ制御プログラムを記録した媒体において、

上記印刷条件をインクの種類別に記憶する不揮発性メモリでは、上記カウンタのカウント値に乗ずることによってインク使用量を算出するためのインク使用量算出係数を記憶することを特徴とするプリンタ制御プログラムを記録した媒体。

【請求項２５】　上記請求項２１～請求項２４のいずれかに記載のプリンタ制御プログラムを記録した媒体において、

上記印刷条件をインクの種類別に記憶する不揮発性メモリでは、上記ヘッドを駆動する際に印加する駆動電圧パターンを記憶することを特徴とするプリンタ制御プログラムを記録した媒体。

【請求項２６】　上記請求項２１～請求項２５のいずれかに記載のプリンタ制御プログラムを記録した媒体において、

上記印刷条件をインクの種類別に記憶する不揮発性メモリでは、上記ヘッドにおけるインク供給系のクリーニングに必要な駆動条件を記憶することを特徴とするプリンタ制御プログラムを記録した媒体。

【請求項２７】　上記請求項２１～請求項２６のいずれかに記載のプリンタ制御プログラムを記録した媒体において、

上記印刷条件をインクの種類別に記憶する不揮発性メモリでは、上記ヘッドにおけるフラッシングに必要な駆動条件を記憶することを特徴とするプリンタ制御プログラムを記録した媒体。

【請求項２８】　上記請求項２１～請求項２７のいずれかに記載のプリンタ制御プログラムを記録した媒体において、

上記インクカートリッジとプリンタ本体に搭載された不揮発性メモリのいずれかまたは組み合わせは、記憶情報の書込と消去とを禁止するよう設定可能であることを特徴とするプリンタ制御プログラムを記録した媒体。

【請求項２９】　上記請求項２１～請求項２８のいずれかに記載のプリンタ制御プログラムを記録した媒体において、

上記ヘッド駆動制御機能では、上記インクカートリッジの交換時に上記インクの種類の比較を実行することを特徴とするプリンタ制御プログラムを記録した媒体。

【請求項３０】　上記請求項２１～請求項２９のいずれかに記載のプリンタ制御プログラムを記録した媒体において、

上記ヘッド駆動制御機能では、上記インク供給系にインクを供給した後に上記プリンタ本体に搭載された不揮発性メモリにて記憶されたインクの種類を当該供給したインクの種類で更新することを特徴とするプリンタ制御プログラムを記録した媒体。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、プリンタ制御装置、プリンタ制御方法およびプリンタ制御プログラムを記録した媒体に関する。

【０００２】

【従来の技術】写真と同等の画質によって印刷を実行できるプリンタとして、インクジェットプリンタが近年急速に普及しつつある。このインクジェットプリンタにおいては、一般に顔料系インクと染料系インクとの２種類が使用されている。この２種類のインクはそれぞれの特性によって画質および耐光性などに一長一短があり、どちらも広く用いられている。また、上記２種類のインクは粘度，密度等が異なっており、同一のヘッドを用いる場合であっても、前記特性に対応させつつ適切な印刷を実行するため、顔料系インクと染料系インクとではインクの吐出量や吐出タイミング等の制御条件がそれぞれ異なっている。

【０００３】

【発明が解決しようとする課題】上述した従来のインクジェットプリンタにおいては以下の課題があった。すなわち、２種類のインクを使用可能なプリンタにおいてもインク供給系の交換や洗浄をしないうちに間違って異なる種類のインクカートリッジを装着してしまうと、インク供給系内部で異系統のインクが混合してしまう。２種類のインクが混合してしまった場合においては、インクの特性に応じた吐出量制御等を実行できなくなるため、印刷品質が損なわれる。従って、上記２種類のインクを交換して使用可能なインクジェットプリンタにおいては、インク供給系におけるインクの混合を防ぐため、インク種類の交換時においてインク供給系の交換や洗浄が必要となっている。

【０００４】さらに、インクジェットプリンタにおいてはインクカートリッジに充填されているインクの残量を監視し、ステータスとして表示したりする場合があるが、上述した従来のインクジェットプリンタではインクを使い切る前に顔料系インクと染料系インクとでインクカートリッジを交換可能であることから、インクを途中まで使った後にインクの種類を切り替え、さらにもう一度インクの種類を元に戻した場合、元のカートリッジのインク残量を正しく判定することができないという問題があった。

【０００５】本発明は、上記課題にかんがみてなされたもので、インク種類の交換が可能なプリンタにおいて異系統のインクの混合を防止しながらインク種類に応じた適正な制御を実施するとともに、何度インクカートリッジを変更してもインク残量を正しく判定することが可能なプリンタ制御装置、プリンタ制御方法およびプリンタ制御装置を提供することを目的とする。

【０００６】

【課題を解決するための手段】上記目的を達成するため、請求項１にかかる発明は、交換可能なインクカートリッジに充填されたインクをヘッドに供給しながら印刷を行うプリンタを制御するように構成されており、インク種類の混合を防止しながら制御する。このため、交換可能なインクカートリッジには記憶内容を更新可能な不揮発性メモリが搭載され、同不揮発性メモリにはインクカートリッジに充填されるインクの種類が記憶される。このインクカートリッジはインクカートリッジ装着部を介してプリンタ本体に着脱されるようになっており、装着時には上記不揮発性メモリからのデータ送受信が可能である。

【０００７】さらに、インクカートリッジからヘッドまでのインク供給チューブ等から構成されるインク供給系に供給されているインクの種類は供給インク記憶手段に記憶され、印刷条件記憶手段にはヘッドの駆動に必要な印刷条件がインクの種類別に記憶されている。ヘッド駆動制御手段は印刷にあたりこれらの記憶情報を使用し、不揮発性メモリに記憶されたインクの種類と上記供給インク記憶手段に記憶されたインクの種類とを比較する。そして、両者のインクの種類が一致する状態でヘッドを駆動し、また、この一致するインク種類に適合する印刷

条件に基づいてヘッドの駆動を制御する。

【0008】すなわち、上記不揮発性メモリに記憶されたインクの種類はインクカートリッジに充填されたインクの種類と一義的に一致し、供給インク記憶手段に記憶されたインクの種類はインク供給系に供給されているインクの種類と一義的に一致するので、ヘッド駆動制御手段がこれらを比較することにより、インク供給系にすでに供給されているインクの種類と異なるインクの種類のインクカートリッジを使用してヘッドを駆動することを防止し、インクの混合を防ぐことができる。

【0009】ここで、上記不揮発性メモリは記憶内容を更新可能であって不揮発性であれば良く種々の態様が採用可能であり、フラッシュメモリなどのＥＥＰＲＯＭにて構成すると好適である。また、インクの種類は上述のようにしてインクの混合を防止するために使用され、このためにはインクの種類を示す情報として充填インクが染料系のものであるか顔料系のものであるかを記憶しておけばよいが、インクの種類としてはこの他にも種々の情報を記憶することが可能である。すなわち、インクの充填日を記憶すれば、当該充填日を参照することにより使用期限の過ぎたインクを使用しないように構成することができる。また、同系統のインクであっても成分が異なる旨を示す情報を記憶することによって、そのインクに対する最善の駆動シーケンスでヘッドの駆動を制御することができる。

【0010】インクカートリッジ着脱部はインクカートリッジを着脱可能であって、インクカートリッジ装着時に不揮発性メモリからのデータ送受信を可能にすることができれば良く、インクを充填可能な容積を有する容器をはめ込み式のホルダに装着し、当該はめ込みと同時に不揮発性メモリの端子の導通を確保するような構成が可能である。供給インク記憶手段においてはインク供給系に供給されているインクの種類を記憶することができれば良く、書き換え可能な種々のメモリにて構成することができる。ＲＡＭ等によっても構成可能であるが、プリンタは頻繁に電源がオン／オフされるものであるところ、フラッシュメモリなどのＥＥＰＲＯＭにて構成すれば好適である。

【0011】印刷条件記憶手段においてはヘッドの駆動に必要な印刷条件を上記インクカートリッジに充填されるインクの種類別に記憶することができれば良く、種々のメモリにて構成することができる。マスクＲＯＭ等によって構成することもできるが、プリンタは使用によって逐次ステータスが変化し、特に本発明は使用インクが変更可能な態様であることから、書き換え可能なフラッシュメモリなどのＥＥＰＲＯＭにて構成すれば好適である。ヘッド制御駆動手段は、種々のメモリ等から情報を読み出し、演算し、メモリやヘッド等を制御できれば良く、ＣＰＵ等で構成すれば好適である。

【0012】さらに、インク残量を正しく判定できるように制御するための構成として請求項２に記載の発明は、上記請求項１に記載のプリンタ制御装置において、上記不揮発性メモリは、インクカートリッジに充填されるインクの残量を記憶しており、上記ヘッド駆動制御手段は、上記ヘッドの駆動に伴って消費するインクの使用量を算出するとともに当該算出に基づいて上記不揮発性メモリに記憶されたインクの残量を更新する構成としてある。

【0013】すなわち、プリンタの駆動とともにインクの残量が更新されるので適正なインクの残量となる。インクの残量はインクカートリッジ自体に搭載される不揮発性メモリに記憶されるので、充填されたインクを消費する前に取り外して他のインクカートリッジを使用し、再び取り外したインクカートリッジを使用してもインク残量は適正なものとなる。むろん、インクカートリッジを取り外して他のプリンタに装着させつつ使用しても当該他のプリンタが本発明にかかるプリンタ制御装置を具備していれば、適正なインク残量となる。

【0014】また、ヘッド駆動制御手段によってインクの使用量を算出する手法は様々であり、そのための構成の一例として請求項３に記載の発明は、上記請求項２に記載のプリンタ制御装置において、上記ヘッド駆動制御手段は、上記ヘッドの駆動とともに増加するカウンタに基づいてインク使用量を算出する構成としてある。すなわち、印刷時にはヘッドが駆動されるので当該ヘッドの駆動とともにカウント値が増加するカウンタを使用すれば、当該カウント値に基づいて容易に使用量を算出することができる。より具体的には、ヘッドによって吐出するドット数をカウントするような手法が採用可能である。本発明においてはインクの種類を変更可能であるので、同じドット数でもインクの種類によって使用量が異なる場合があるが、ドット数に基づいてインクの種類毎に使用量を算出すればよい。このようにカウント値に基づいてインクの使用量を算出する場合には、このカウントはインクの種類によって特に区別することなく単一のカウンタを設けるだけでよい。

【0015】さらに、上記ヘッドの駆動に必要な印刷条件としては種々の条件が存在し、インクの種類別に記憶する必要がある印刷条件の具体例として請求項４に記載の発明は、上記請求項３に記載のプリンタ制御装置において、上記印刷条件記憶手段は、上記カウンタのカウント値に乗ずることによってインク使用量を算出するためのインク使用量算出係数を記憶する構成としてある。

【0016】すなわち、上述のカウント値とインクの使用量とは通常比例関係にあるので、カウント値に乗ずることによってインク使用量を算出するようなインク使用量算出係数を設ければ、一回の乗算のみで容易にカウント値から使用量を得ることができる。また、インクの種類毎に使用量を算出するためには、インクの種類毎のインク使用量係数を記憶するのみで良く、非常に簡単に構

成することができ、インクの種類が増えたり特性の異なるインクに対応する必要が生じたときにも簡単に対応することができる。

【0017】さらに、インクの種類別に記憶する必要がある印刷条件の他の具体例として請求項５に記載の発明は、上記請求項１～請求項４のいずれかに記載のプリンタ制御装置において、上記印刷条件記憶手段は、上記ヘッドを駆動する際に印加する駆動電圧パターンを記憶する構成としてある。すなわち、顔料系のインクと染料系のインクのようにインクの種類が異なると、ヘッドを駆動する条件が異なる。例えば、ピエゾ素子の伸縮等によってインクの吐出量や吐出タイミング等を制御するプリンタの場合、上記インク種類が異なれば、一回のインク吐出量や吐出タイミング等が異なってくる。これらの吐出量等はヘッドに印加される駆動電圧パターンを変更することによって制御されることから、印刷条件としてインクの種類別に駆動電圧パターンを記憶すると容易にインクの種類に応じた印刷を実行することができる。

【0018】さらに、インクの種類別に記憶する必要がある印刷条件の他の具体例として請求項６に記載の発明は、上記請求項１～請求項５のいずれかに記載のプリンタ制御装置において、上記印刷条件記憶手段は、上記ヘッドにおけるインク供給系のクリーニングに必要な駆動条件を記憶する構成としてある。すなわち、長時間プリンタを使用しなかった場合や印刷品質が低下してきた場合にインク供給系をクリーニングすることがあり、この際にはインクを一旦排出してワイピング等を実施することから、排出を的確に行わせるためにはインクの種類毎の条件でヘッドを駆動する必要があり、このような場合に対応することができる。

【0019】さらに、本発明においてはインクの種類を交換できるようになっていることから、交換に際してはカートリッジからヘッドまでのインク供給系をも洗浄する必要があり、かかる洗浄シーケンスを実行する場合に的確にインク供給系のインクを排出させるためにはインクの種類毎の条件でヘッドを駆動する必要があり、このような場合にも対応することができる。

【0020】さらに、インクの種類別に記憶する必要がある印刷条件の他の具体例として請求項７に記載の発明は、上記請求項１～請求項６のいずれかに記載のプリンタ制御装置において、上記印刷条件記憶手段は、上記ヘッドにおけるフラッシングに必要な駆動条件を記憶する構成としてある。すなわち、ワイピングによりノズルから逆流した混色インクを吐出排出したり、インクの増粘による目詰まりを防止するためにフラッシングを実行することがあるが、このフラッシングを実行するタイミングやフラッシング時の吐出排出量はインク種類の特性によって決定されるべきものであることから、的確にフラッシングを実行するためにはインクの種類毎の条件でヘッドを駆動する必要があり、このような場合に対応することができる。

【0021】さらに、プリンタの電源が不意にオフになった場合などにも、再電源投入後にインクの混合を防止し、インク残量を適切に判定し、的確にインクの種類毎のヘッド駆動を実行可能に構成するための具体例として請求項８に記載の発明は、上記請求項１～請求項７のいずれかに記載のプリンタ制御装置において、上記不揮発性メモリと供給インク記憶手段と印刷条件記憶手段とのいずれかまたは組み合わせは、記憶情報の書込と消去とを禁止するよう設定可能である構成としてある。

【0022】すなわち、記憶情報の書込と消去とを禁止することができれば、電源が不意にオフになったりして電源が不安定になった場合やノイズが増加した場合などにおいても必要な記憶情報が更新されることはなく、再電源投入後に元の状態でプリンタを駆動することができる。例えば、再電源投入後に供給インク記憶手段の記憶情報は元のままであるので、インク供給系にすでにインクが供給されているにもかかわらず、さらに異なるインクの供給を実行しようとしてインクを混合することはない。また、インク供給系に供給されているインクと異なるインクを使用してヘッドを駆動することもない。さらに、電源が不安定になったときに上記インク使用量を算出するための情報を印刷条件記憶手段等に記憶しておき、電源が安定化した後に当該記憶したインク使用量に基づいてインク残量を更新すれば、より正確なインク残量を得ることができる。ここで、記憶情報の書込と消去とを禁止するといっても、むろん記憶情報の更新が必要なときには書込と消去の禁止状態を解除して更新を行う。

【0023】さらに、上記ヘッド駆動制御手段においてインクの混合を防止するように制御するための構成の具体例として請求項９に記載の発明は、上記請求項１～請求項８のいずれかに記載のプリンタ制御装置において、上記ヘッド駆動制御手段は、上記インクカートリッジの交換時に上記インクの種類の比較を実行する構成としてある。すなわち、本発明にかかるプリンタはインクカートリッジを交換可能であるため、この交換時にインクの種類を誤ってしまうことが多いと考えられ、かかる交換時に上記比較を実行することにより、確実にインクの混合を防止することができる。ここで、インクカートリッジの交換を検出するためには種々の態様が採用可能であり、たとえば、インクカートリッジの装着時と取り外し時に所定の信号を出力するように構成し、装着を示す信号を検出したときに比較を実行するように構成することができる。

【0024】さらに、上記ヘッド駆動制御手段においてインクの混合を防止するための構成の具体例として請求項１０に記載の発明は、上記請求項１～請求項９のいずれかに記載のプリンタ制御装置において、上記ヘッド駆動制御手段は、上記インク供給系にインクを供給した後

に上記供給インク記憶手段に記憶されるインクの種類を当該供給したインクの種類で更新する構成としてある。

【００２５】すなわち、本発明にかかるプリンタはカートリッジの交換によって使用するインクの種類を適宜変更可能であることから、当該インクの種類の変更を行う際には上記インク供給系に供給されているインクも洗浄し、新たに供給し直すことになる。そこで、インク供給系に対するインクの供給後にヘッド駆動制御手段によって供給インク記憶手段に記憶されるインクの種類を更新すると、何度インクの交換処理をしても上記インクの種類の比較によって常に適正なインクを使用しつつヘッドを駆動することができ、インクの混合を防止することができる。

【００２６】このように、インクカートリッジに搭載された不揮発性メモリにインクの種類とインクの残量とを記憶しておき、これらを参照してインクの混合を防止するとともにインクの残量を適正に把握する手法は必ずしも実体のある装置に限られる必要はなく、その方法としても機能することは容易に理解できる。このため、請求項１１～請求項２０にかかる発明は、前記プリンタ制御装置が実施する制御方法に対応した構成としてある。すなわち、必ずしも実体のある装置に限らず、その方法としても有効であることに相違はない。

【００２７】ところで、このようなプリンタ制御装置は単独で存在する場合もあるし、ある機器に組み込まれた状態で利用されることもあるなど、発明の思想としてはこれに限らず、各種の態様を含むものである。従って、ソフトウェアであったりハードウェアであったりするなど、適宜、変更可能である。発明の思想の具現化例としてプリンタ制御装置のソフトウェアとなる場合には、かかるソフトウェアを記録した記録媒体上においても当然に存在し、利用されるといわざるをえない。その意味で、請求項２１～請求項３０にかかる発明は、前記プリンタ制御装置をコンピュータで実施させる各ステップに対応した構成としてある。

【００２８】むろん、その記録媒体は、磁気記録媒体であってもよいし光磁気記録媒体であってもよいし、今後開発されるいかなる記録媒体においても全く同様に考えることができる。また、一次複製品、二次複製品などの複製段階については全く問う余地無く同等である。上記媒体とは異なるが、供給方法として通信回線を利用して行なう場合であれば通信回線が伝送媒体となって本発明が利用されることになる。

【００２９】さらに、一部がソフトウェアであって、一部がハードウェアで実現されている場合においても発明の思想において全く異なるものはなく、一部を記録媒体上に記憶しておいて必要に応じて適宜読み込まれるような形態のものとしてあってもよい。また、本発明をソフトウェアで実施する場合、発明がプログラムを記録した媒体として実現されるのみならず、本発明がプログラム

自体として実現されるのは当然であり、プログラム自体も本発明に含まれる。

【００３０】

【発明の効果】以上説明したように請求項１、請求項１１、請求項２１にかかる発明によれば、インクの混合を防止することができ、インクの種類に応じた適切な制御を実行することが可能なプリンタ制御装置、プリンタ制御方法およびプリンタ制御プログラムを記録した媒体を提供することができる。

【００３１】また、請求項２、請求項１２、請求項２２にかかる発明によれば、インクカートリッジ内の適正なインク残量を判定することができる。さらに、請求項３、請求項１３、請求項２３にかかる発明によれば、容易にインク使用量を算出することができる。さらに、請求項４、請求項１４、請求項２４にかかる発明によれば、インクの種類毎に使用量を算出するための構成を容易に実現することができ、カウント値から容易に使用量を得ることができる。さらに、請求項５、請求項１５、請求項２５にかかる発明によれば、容易にインクの種類に応じた印刷を実行することができる。

【００３２】さらに、請求項６、請求項１６、請求項２６にかかる発明によれば、インクの種類毎の条件でクリーニングを行うことができる。さらに、請求項７、請求項１７、請求項２７にかかる発明によれば、インクの種類毎の条件でフラッシングを行うことができる。さらに、請求項８、請求項１８、請求項２８にかかる発明によれば、プリンタの電源が不意にオフになった場合などにも、再電源投入後にインクの混合を防止し、インク残量を適切に判定し、的確にインクの種類毎のヘッド駆動を実行することができる。さらに、請求項９、請求項１９、請求項２９にかかる発明によれば、確実にインクの混合を防止することができる。さらに、請求項１０、請求項２０、請求項３０にかかる発明によれば、確実にインクの混合を防止することができる。

【００３３】

【発明の実施の形態】以下、図面にもとづいて本発明の実施形態を説明する。図１は、本発明の一実施形態にかかるプリンタ制御装置を搭載したインクジェットプリンタの内部構成を示す概略斜視図であり、図２は当該インクジェットプリンタの各ハードウェアの接続状況を示すブロック図である。図において、インクジェットプリンタ１０はメイン基板１１を備えており、メイン基板１１に印刷部２０とパネル部３０とカートリッジ部４０とが接続されており、メイン基板１１上に備えられたＣＰＵ１２が各部を制御することによりプリンタとして機能する。

【００３４】メイン基板１１上には上記ＣＰＵ１２の他、ＡＳＩＣ１３とフラッシュメモリ１４とヘッド駆動部１６とを備えている。ＡＳＩＣ１３は後述するヘッド２２を駆動するためにカスタマイズされたＩＣであり、

上記ＣＰＵ１２と所定の信号を送受信しつつヘッド２２駆動のための処理を行う。この処理の一つとして、インク使用量カウンタを備えており、印刷されるドット数を各インク色毎にカウントする。この他にも、後述するヘッド駆動部１６への印加電圧データを出力する。ヘッド駆動部１６は専用ＩＣと駆動用トランジスタと放熱板等からなる回路であり後述するヘッド２２に内蔵されるピエゾ素子への印加電圧パターンを生成する。

【００３５】フラッシュメモリ１４は、電気的に記憶内容を消去可能なＥＥＰＲＯＭであり、チップ一括またはブロック単位でデータを消去することができる。さらに、本実施形態にかかるフラッシュメモリ１４はブートブロック型であり、所定のブロックに対してはハードウェア的なデータの書込と消去とを禁止することができる。

【００３６】印刷部２０は主にローラ２１とヘッド２２とを備えており、ヘッド２２は上記メイン基板１１と所定の中継ケーブルを介して接続されている。ローラ２１は図示しないモータ制御部によって駆動される図示しないモータによって回転しながら印刷用紙を送るように構成されている。ヘッド２２は図示しないキャリッジに搭載されており、同キャリッジはヘッド２２を上記ローラ２１の外周近傍に配設させるとともにヘッド２２をローラ２１の軸方向に往復移動可能にしている。

【００３７】ヘッド２２には各インク色別のチューブ２２ａが接続されており、各色インクの供給を受けるようになっている。また、ヘッド２２には図示しないピエゾ素子が備えられており、上記チューブ２２ａから吐出口まで連通するインク室でピエゾ素子が駆動されることによって、ドット単位でインクを吐出する。ヘッド２２とヘッド駆動部１６とは所定の中継ケーブルおよび基板上の配線によって接続されており、同ヘッド駆動部１６は上記ＡＳＩＣ１３からの指令に応じて所定の電圧を生成するとともにヘッド２２に同生成電圧を印加し、上記キャリッジやピエゾ素子を駆動するようになっている。

【００３８】パネル部３０は液晶表示体３１と操作ボタン３２とを備えており、パネル部３０は上記メイン基板１１とパネルＩ／Ｏ３３を介して所定の中継ケーブルによって接続されている。液晶表示体３１はＣＰＵ１２から送信される所定の信号に基づいて文字等を表示するディスプレイであり、エラーメッセージやステータス等が表示可能である。操作ボタン３２は、ユーザやサービスマンがインクジェットプリンタ１０を操作する際に使用するボタンであり、単独のボタン押し込み操作や複数のボタン押し込み操作によって上記ＣＰＵ１２が操作内容を判別し、電源のＯＮ／ＯＦＦや印刷データの排出，エラーメッセージの解除，インク交換処理の実行，クリーニングの実行等を指示できるようになっている。

【００３９】カートリッジ部は主にサブ基板４１とカートリッジホルダ４２とインクカートリッジ４３とを備え

ている。本実施形態にかかるインクジェットプリンタ１０はシアン，マゼンタ，イエロー，ライトシアン，ライトマゼンタ，ブラックの六色を使用するようになっており、インクカートリッジ４３にそれぞれのインクを充填する。インクカートリッジはカートリッジメモリ４３ａを搭載しており、同カートリッジメモリ４３ａには充填されるインクの種類とインクの残量が記憶される。ここで、インクの種類としては染料系インクであるか顔料系インクであるかを示すデータが記録される。すなわち、同カートリッジメモリ４３ａが上記不揮発性メモリを構成する。各カートリッジホルダ４２はカートリッジメモリ４３ａとの接触部４２ａを備えており、インクカートリッジ４３がカートリッジホルダ４２に装着されるとカートリッジメモリ４３ａと接触してデータ送受信のための接続を確保する。また、上記カートリッジホルダ４２は図示しないインク供給針を備えており、インクカートリッジ４３が装着されると、同インクカートリッジ４３が備えている図示しないインク供給口と接触してインクの供給経路を形成する。カートリッジホルダ４２にはチューブ２２ａが取り付けられるようになっており、同チューブ２２ａを介してインクカートリッジ４３内に充填されたインクが上記ヘッド２２に供給される。

【００４０】各インクカートリッジ４３はカートリッジホルダ４２に装着されることによりインクジェットプリンタ１０に搭載され、カートリッジホルダ４２に装着された状態で上記チューブ２２ａを介してインク供給可能になるとともに上記カートリッジメモリ４３ａはデータを送受信可能になる。すなわち、カートリッジホルダ４２には所定の中継ケーブル４０が接続されており、インクカートリッジ４３がカートリッジホルダ４２に装着された状態で当該中継ケーブル４０とカートリッジメモリ４３ａとの通信回線が確保される。このように、本実施形態においては、カートリッジホルダ４２が上記装着部を構成する。

【００４１】カートリッジホルダ４２に接続された中継ケーブル４０はサブ基板４１に接続されるようになっており、同サブ基板４１上に搭載されたコントロールＩＣ４１ａから所定の信号が送受信されることによって上記カートリッジメモリ４３ａが制御される。サブ基板４１は、さらに所定の中継ケーブルを介して上記メイン基板１１に接続されている。上記コントロールＩＣ４１ａは複数インクを使用すること、すなわち複数のカートリッジメモリ４３ａを制御するために搭載されたＩＣでありメイン基板上のＣＰＵ１２が所定の信号を送受信してコントロールＩＣ４１ａと通信を行うことによって、カートリッジメモリ４３ａに記録されたインクの種類の読み出しや、インク残量の更新等を行うようになっている。また、本実施形態においては、インクカートリッジ４３の着脱が行われたか否かを判別するために、カートリッジホルダ４２からインクカートリッジ４３が取り外され

たときには、上記コントロールＩＣ４１ａがインクカートリッジ４３の取り外しを示す信号を出力し、インクカートリッジ４３が装着されたときには、上記コントロールＩＣ４１ａがインクカートリッジ４３の装着を示す信号を出力するようになっている。

【００４２】上記メイン基板１１上には、さらに所定の通信Ｉ／Ｏ１５が備えられており、同通信Ｉ／Ｏ１５を介してインクジェットプリンタ１０の外部のコンピュータ５０と接続される。コンピュータ５０においては同インクジェットプリンタ１０用のドライバがインストールされており、利用者がデジタル写真画像データの印刷を実行するとドライバが所定のデータ変換等を行うとともに印刷データと印刷指示とをインクジェットプリンタ１０に送信し、上記ＣＰＵ１２が印刷指示に従って印刷データを印刷する。

【００４３】図３は、フラッシュメモリ１４のメモリマップの要部を示している。本実施形態にかかるインクジェットプリンタ１０は、染料系のインクと顔料系のインクの双方が使用可能であることから、フラッシュメモリ１４においては両系統のインクに対して適切な制御を行うためにインクの系統別のパラメータ等が記憶されている。具体的には、インク供給系すなわち上記チューブ２２ａ内に所定のインクを充填する初期充填が行われたか否かを示す初期フラグと、現在使用中のインクの種類を示すインクモードとが記憶される。

【００４４】さらに、インクの種類別の駆動パラメータである印刷条件が顔料系のインクと染料系のインクのそれぞれに対して記憶されている。これらのデータはハードウェア的なデータの書込と消去とを禁止可能なプロテクトブロックに記憶されている。このように、本実施形態においてはフラッシュメモリ１４が上記供給インク記憶手段と印刷条件記憶手段とを構成する。印刷条件にはカウンタ係数と駆動電圧とクリーニング条件とフラッシング条件とがあり、カウンタ係数は上記ＡＳＩＣ１３におけるカウント値に乗ぜられる係数であり、当該乗算によってドット数という統一されたカウントから顔料系，染料系双方のインク使用量を適切に算出する。また、顔料系のインクと染料系のインクとではインクの特性すなわち粘度等が異なるので、インクの吐出やクリーニング，フラッシング等、同様の動作をさせるとしてもヘッド２２の具体的な駆動は異なっている。

【００４５】そこで、各系統毎に駆動電圧とクリーニング条件とフラッシング条件とが記憶されており、ＣＰＵ１２はかかるデータを読み出して上記ＡＳＩＣ１３に指示し、ヘッド駆動部１６が当該指示に従って所定のヘッド駆動を実施することによって双方の系統のインクに対して適切な制御を行う。例えば、駆動電圧は印刷時に上記ヘッド駆動部１６にて生成する印加電圧のパターンを示すデータであり、図４に示すように異なるパターンで電圧を印加する。

【００４６】すなわち、印刷条件としての駆動電圧はタイマデータを記載したルックアップテーブルからなり、ＣＰＵ１２が同ルックアップデータを参照してＡＳＩＣ１３に指示すると、ＡＳＩＣ１３は当該タイマデータを変換してヘッド駆動部１６に印加電圧データを出力する。ヘッド駆動部１６は前記印加電圧データによって電圧の時間的変化であるパルスを発生する。パルスは主に上昇パルスと下降パルスとがあり、上昇パルス中には印加電圧が上昇するとともに上記ピエゾ素子が駆動され、インク室の容積が減少する。また、下降パルス中には印加電圧が下降するとともに上記ピエゾ素子が駆動され、インク室の容積が増加する。従って、これらのパルスの幅を調整することによって上記ヘッド駆動部１６が生成する電圧は図４に示すような略台形状になり、かかる電圧でインクの吐出が制御される。

【００４７】同図４の上側の電圧パターンは顔料系のものであり、当該顔料系のインクではまず期間ｔ１１において下降パルスを入力してインク室の容積を増加させる。そして、期間ｔ１２でパルスの入力を停止してピエゾ素子を保持することによりインクの状態を落ちつかせた後、期間ｔ１３では上昇パルスを入力してインク室の容積を減少させ、インクを吐出させる。さらに、期間ｔ１４でパルスの入力を停止してこの状態を保持し、期間ｔ１５で下降パルスを入力して吐出インクを分断する。この後、期間ｔ１６でパルスの入力を停止してこの状態を一定期間保持するとともにキャリッジを駆動して次のドットに対するインク吐出シーケンスを行う。

【００４８】これに対して、図４の下側の電圧パターンは染料系のものであり、当該染料系のインクではまず期間ｔ２１において上昇パルスを入力してインク室の容積を減少させる。そして、期間ｔ２２でパルスの入力を停止してピエゾ素子を保持することによりインクの状態を落ちつかせた後、期間ｔ２３では下降パルスを入力してインク室の容積を増加させ、期間ｔ２４でこの状態を保持してインクの状態を落ちつかせる。さらに、期間ｔ２５では再び上昇パルスを入力してインク室の容積を減少させ、インクを吐出させる。この後には、期間ｔ２６でこの状態を保持し、期間ｔ２７で下降パルスを入力して吐出インクを分断し、期間ｔ２８でこの状態を保持してドットの吐出シーケンスを終了する。

【００４９】このように、顔料系のインクと染料系のインクとではインク特性の差異からヘッド駆動パターンも異なっており、それぞれの系統に適した制御を行うためにインク系統別に駆動電圧が保持されており、インクの種類に応じて適宜参照される。この印刷時の駆動電圧の他に、ヘッド駆動部１６はクリーニングやフラッシングのための電圧も生成可能になっており、ヘッド２２は当該電圧によって印刷とは関係のないインクの吐出を行なうことができる。すなわち、ヘッド２２の往復運動の一方端の直下にはポンプユニット２４が配設されており、

同ポンプユニット位置まで搬送されたヘッド２２に対して負圧を作用させることによって増粘インクの吸引やチューブ２２ａに対する初期充填処理を実行することができる。

【００５０】ヘッド駆動部１６は図示しないケーブルを介してポンプユニット２４に対して所定の駆動電圧を印加するようになっており、印刷中に一定時間が経過するとインクの種類に応じたフラッシング条件が参照され、ヘッド２２に所定のインク吐出を実行させるし、上記操作ボタン３２における所定の操作に応じてインク種類に応じたクリーニング条件を参照するとともにヘッド２２に所定のクリーニング操作を実行できるようになっている。さらに、インクカートリッジの交換後等にはチューブ２２ａに対する初期充填処理を実行する。

【００５１】図５は、上記構成において本発明にかかるプリンタ制御装置が実施する制御の概略を示した概略図である。プリンタ制御装置において主な制御は上記ＣＰＵ１２が担っており、インクの種類に応じた処理を行うため、ＣＰＵ１２は上記カートリッジメモリ４３ａに記憶されたインクの種類とフラッシュメモリ１４に記憶されたインクモードとを比較して、インクモードとして記憶してある現在使用中すなわちインク供給系にインクが充填されているインクの種類とインクカートリッジ４３に充填されているインクの種類とを一致させた状態で印刷を行う。

【００５２】また、これらの比較によって一致しているとされたインクの種類に適合した条件でヘッド２２を駆動するためフラッシュメモリ１４を参照し、現在使用中のインクの種類に合わせて顔料系制御あるいは染料系制御のパラメータを使用してヘッド２２を駆動する。さらに、ＡＳＩＣ１３にてカウントされているドット数にインクの種類に応じたカウンタ係数を乗じてインクの使用量を算出するとともに、当該使用量を上記カートリッジメモリ４３ａのインク残量から減じるようにして更新することにより、顔料系インクであっても染料系インクであってもインク残量を正確に記憶していく。このように、本実施形態においてはＣＰＵ１２とＡＳＩＣ１３とヘッド駆動部１６とコントロールＩＣ４１ａとが上記ヘッド駆動制御手段を構成する。

【００５３】図６～８は以上のような制御を含めてインクジェットプリンタ１０でＣＰＵ１２が実行する処理のフローチャートを示している。図６は、インクジェットプリンタ１０のブート後から実行される処理であり、ステップＳ１００ではＣＰＵ１２がフラッシュメモリ１４を参照し、上記初期フラグがオンであるか否かを判別する。同ステップＳ１００にて初期フラグがオンであると判別されないときには、上記チューブ２２ａ等のインク供給系にインクが充填されていないとして、当該チューブ２２ａ内にインクを充填するための処理を行う。

【００５４】このとき、ステップＳ１０５においてＣＰＵ１２は上記コントロールＩＣ４１ａと通信を行い、同コントロールＩＣ４１ａにカートリッジメモリ４３ａのインク種類を読み出させ、各六色のインクの種類を把握する。ステップＳ１１０ではこの読み出したインクの種類が六色とも同一の種類であるか否かを判別し、同一種類であると判別されないときにはステップＳ１１５にて上記パネルＩ／Ｏ３３を介してパネル部３０を制御し、液晶表示体３１に図９に示すエラーメッセージＡを表示させる。

【００５５】エラーメッセージＡは「カートリッジが６色統一されていません」というメッセージであり、当該メッセージを表示した状態で利用者が間違えて挿入したインクカートリッジ４３を適正なものに取り替えることを促しつつ上記ステップＳ１０５以降の処理を繰り返す。上記ステップＳ１１０にてインクの種類が六色とも同一の種類であると判別されたときには、ステップＳ１２０にてインク供給系に対するインクの充填処理を実行する。当該充填処理はインク供給系にインクを充填させる特別なシーケンスであり、かかるシーケンスが実行された後にはインクカートリッジ内のインクがインク供給系に充填され、ヘッド２２のインク室内にもインクが充填される。従って、この状態でヘッド２２内のピエゾ素子を駆動するとヘッド２２のノズルからインクが吐出される。

【００５６】この充填処理の後には、ステップＳ１２５にて上記フラッシュメモリ１４にアクセスして上記充填したインクの種類をインクモードとして設定する。さらに、ステップＳ１３０にて上記フラッシュメモリ１４にアクセスして上記初期フラグをオンにする。このような充填処理を行った場合と上記ステップＳ１００にて初期フラグがオンであると判別されたときには、ステップＳ１３５にて上記フラッシュメモリ１４にアクセスして上記インクモードを読み出すとともに、ステップＳ１４０にて上記コントロールＩＣ４１ａにカートリッジメモリ４３ａのインク種類を読み出させ、装着されているインクカートリッジ４３に充填されたインクの種類を把握する。

【００５７】そして、ステップＳ１４５にてインクカートリッジ４３に充填されたインクの種類とフラッシュメモリ１４に記憶されたインクモードとが一致しているか否かを判別する。ステップＳ１４５にて両者が一致していると判別されたときはステップＳ２００にて印刷処理を実行する。ステップＳ１４５にて両者が一致していると判別されないときにはステップＳ１５０にて上記パネルＩ／Ｏ３３を介してパネル部３０を制御し、液晶表示体３１に図１０に示すエラーメッセージＢを表示させる。

【００５８】エラーメッセージＢは「インクモードの異なるインクが装着されています」というメッセージであり、当該メッセージを表示した状態で利用者が間違えて

挿入したインクカートリッジ４３を適正なものに取り替えることを促しつつ上記ステップＳ１４０以降の処理を繰り返す。ステップＳ２００の印刷処理においては上記コンピュータ５０から印刷指示とともに印刷データ送信されるのを待機しており、印刷指示の後に図７に示す処理を行う。

【００５９】ステップＳ２０５では、上記ＡＳＩＣ１３にアクセスして同ＡＳＩＣ１３内のインク使用量ステップＳ２１０にてカウンタを「０」にクリアし、ステップＳ２１０にて上記コントロールＩＣ４１ａにカートリッジメモリ４３ａのインク種類を読み出させ、装着されているインクカートリッジ４３に充填されたインクの種類を把握する。そして、ステップＳ２１５にてフラッシュメモリ１４にアクセスし、当該インクの種類に適合した印刷条件を読み出す。

【００６０】ステップＳ２２０以降においては上記コンピュータ５０から送信された印刷データに基づいて所定ライン分の駆動を行いつつ印刷を実行する。ステップＳ２２０では、上記インクの種類に適合した印刷条件の駆動電圧を参照して上記ＡＳＩＣ１３に指令を送信し、ヘッド駆動部１６に上記パルスを出力させることによってヘッド２２を駆動する。このようにしてヘッド２２を駆動し、キャリッジにてヘッド２２を移動させるなどして印刷を実行しつつ、ステップＳ２２５ではＡＳＩＣ１３にてカウントを実行している。

【００６１】所定ライン分の印刷が終了するとステップＳ２３０にてフラッシュメモリ１４にアクセスしてインクの種類に適合したカウンタ係数を読み出し、ステップＳ２３５にて当該読み出したカウンタ係数と上記ＡＳＩＣ１３のカウント値とを乗ずることによってインクの使用量を算出する。ステップＳ２４０では、上記コントロールＩＣ４１ａに指令を送り、カートリッジメモリ４３ａに記憶されたインク残量から同ステップＳ２３５にて算出したインクの使用量を減じるようにして当該インク残量を更新させる。ステップＳ２４５では上記ＡＳＩＣ１３にアクセスして同ＡＳＩＣ１３内のインク使用量ステップＳ２１０にてカウンタを再び「０」にクリアする。

【００６２】そして、ステップＳ２５０においては上記コンピュータ５０から送信された印刷データの全てを印刷し終えたか否かを判別し、印刷し終えたと判別されるまで上記ステップＳ２２０以降の処理を繰り返す。尚、本実施形態にて上記ヘッド２２はキャリッジによる往復運動の一方の端位置においてフラッシングがなされる。すなわち、印刷中に一定時間が経過した後には、ヘッド２２がフラッシング領域にまで搬送され、フラッシュメモリ１４から上記ステップＳ２１０にて読み出したインクの種類に適合するフラッシング条件を読み出しつつフラッシングを実行する。また、本実施形態においてはインクカートリッジ４３が取り外されたときに印刷を実行し続けることを防止するため、上記インクカートリッジ４３が取り外されたときにコントロールＩＣ４１ａが出力する信号が検出されたときには図７のステップＳ２０５～Ｓ２５０の処理を中断して図８に示す処理を実行する。

【００６３】インクカートリッジ４３が取り外されたことを示す信号が検出されると、ステップＳ３０５にて上記パネルＩ／Ｏ３３を介してパネル部３０を制御し、液晶表示体３１に図１１に示すエラーメッセージＣを表示させる。エラーメッセージＣは「カートリッジを装着して下さい」というメッセージであり、当該メッセージを表示した状態で利用者がインクカートリッジ４３を装着することを促しつつステップＳ３１０にてインクカートリッジ４３を装着したことを示す信号が検出されるまで上記ステップＳ３０５以降の処理を繰り返す。ステップＳ３１０にてインクカートリッジ４３を装着したことを示す信号が検出されると、ステップＳ３１５にて上記フラッシュメモリ１４にアクセスして上記インクモードを読み出すとともに、ステップＳ３２０にて上記コントロールＩＣ４１ａにカートリッジメモリ４３ａのインク種類を読み出させ、装着されているインクカートリッジ４３に充填されたインクの種類を把握する。

【００６４】そして、ステップＳ３２５にてインクカートリッジ４３に充填されたインクの種類とフラッシュメモリ１４に記憶されたインクモードとが一致しているか否かを判別する。ステップＳ３２５にて両者が一致していると判別されないときにはステップＳ３３０にて上記パネルＩ／Ｏ３３を介してパネル部３０を制御し、液晶表示体３１に図１０に示すエラーメッセージＢを表示させる。ステップＳ３２５にて両者が一致していると判別されたときはステップＳ３２５にてフラッシュメモリ１４にアクセスしてインクの種類に適合したカウンタ係数を読み出し、ステップＳ３４０にて当該読み出したカウンタ係数と上記ＡＳＩＣ１３にて保持されているカウント値とを乗ずることによってインクの使用量を算出する。

【００６５】ステップＳ３４５では、上記コントロールＩＣ４１ａに指令を送り、カートリッジメモリ４３ａに記憶されたインク残量から同ステップＳ３４０にて算出したインクの使用量を減じるようにして当該インク残量を更新させる。すなわち、再装着されるインクカートリッジ４３の充填インクが正しいか否かを判定した上で、カートリッジが抜かれるまでカウントしていたカウント値に基づいてインク残量を更新する。従って、インクカートリッジ４３が印刷途中で取り外された場合であっても正しいインク残量となる。この後、上記図７に示す印刷処理に復帰する。

【００６６】さらに、本実施形態においては顔料系のインクと染料系のインクとの双方を使用可能であり、当該インクの種類を変更することができる。インク系統の交換に際して、両系統のインクが混ざり合うと印刷物において適切な発色とならないし、ヘッド２２等の駆動パターンも異なることから種々の不都合が生じる。従って、インク系統の交換に際しては、上記インク供給系の洗浄も実施する必要がある。利用者あるいはサービスマンは、上記パネル部３０の操作ボタン３２にて所定の押し込み操作を行うことによってインクの交換処理を実施することが可能になっている。

【００６７】すなわち、上記操作ボタン３２において所定の押し込み操作を行うと、当該操作に応じた所定のトリガが出力され、ＣＰＵ１２が当該トリガを受信すると印刷の実行中であっても図６のステップＳ４００に示す交換処理を実行する。この交換処理においてステップＳ４１０では、上記パネル部３０の液晶表示体３１に所定のガイドメッセージを表示しながら、カートリッジホルダ４２に洗浄液の入ったカートリッジを装着させるなどして、インク供給系に対する洗浄シーケンスを実行する。この洗浄処理の後は、インクジェットプリンタ１０のインク供給系は新品の状態と同等、すなわち初期フラグがオフの状態と同様であるので、上記ステップＳ１０５以降の処理を実行する。

【００６８】さらに、このインク系統変更時の洗浄処理の他にヘッド２２を洗浄するクリーニング操作を実行可能であり、上記パネル部３０の操作ボタン３２にて所定の押し込み操作を実行すると、当該操作に応じた所定のトリガが出力されＣＰＵ１２が当該トリガを受信すると、ＣＰＵ１２が上記ＡＳＩＣ１３を介してヘッド駆動部１６に指示を送り、インクを負圧により排出させた後にゴムなどの弾性板からなるワイピング部材によりヘッド表面のワイピング操作を行うようになっている。

【００６９】以下、上記構成および処理フローによって本実施形態にて行われる動作例を説明する。図１２は、各インクカートリッジ４３内に充填されたインクの種類とフラッシュメモリ１４に記憶されるインクモードの内容とカートリッジを取り外したときに出力される信号とＡＳＩＣ１３内のカウント値とをタイミングチャートによって示している。本動作例では初期状態として、シアン（Ｃ），マゼンタ（Ｍ），ブラック（Ｋ），ライトシアン（ＬＣ）のインクカートリッジに顔料系のインク、イエロー（Ｙ），ライトマゼンタ（ＬＭ）のインクカートリッジには染料系のインクが充填されているとする。

【００７０】この状態で、インクジェットプリンタ１０をブートすると、上記図６に示す処理が実行され、ステップＳ１００にて初期フラグがオンであるか否かを判別し、初期フラグがオンではないとしてステップＳ１０５におけるインク種類の読み出しと、ステップＳ１１０における判別を行う。ここで、インクカートリッジに充填されているインクは顔料系のものと染料系のものとが混在していることから、ステップＳ１１０の判別を経て、ステップＳ１１５において液晶表示体３１上にエラーメッセージＡを表示させる。

【００７１】利用者はこのエラーメッセージＡを視認することによってインクの種類が混在していることを把握し、時刻ｔ１にて上記イエローとライトマゼンタのインクカートリッジを取り外すとともに顔料系のインクが充填されたイエローとライトマゼンタのインクカートリッジを装着する。この結果、ステップＳ１１０では全てのインクカートリッジに同一種類のインクが充填されていると判別し、ステップＳ１２０にてインク供給系に対する初期充填を実行し、ステップＳ１２５にてフラッシュメモリ１４にインクモードを顔料系として設定するとともにステップＳ１３０にて初期フラグをオンにする。

【００７２】さらに、初期フラグがオンになっている場合でも、インクジェットプリンタ１０を輸送したりする際にインクカートリッジ４３を一旦取り外し、再び装着した場合には、インクの種類を誤ってしまうことがある。例えば、上記初期充填をした後に時刻ｔ２で染料系のインクが充填されたインクカートリッジ４３を装着してインクジェットプリンタ１０をブートしたとする。

【００７３】この場合には、ステップＳ１００にて初期フラグがオンになっていると判別した後、ステップＳ１３５にてフラッシュメモリ１４に記憶されたインクモードが顔料系である旨を把握し、ステップＳ１４０にてカートリッジメモリ４３ａに記憶されたインクの種類を読み出し染料系である旨を把握する。この結果ステップＳ１４５では両者が一致しないと判別され、液晶表示体３１上にエラーメッセージＢを表示させる。

【００７４】利用者はこのエラーメッセージＢを視認することによってインクの種類を間違えたことを把握し、時刻ｔ３にて顔料系のインクが充填されたインクカートリッジ４３を装着し直す。この結果、ステップＳ１４５にてインクモードと装着されているインクカートリッジのインク種類が一致していると判別され、ステップＳ２００の印刷処理が実行される。印刷処理が開始されると、ステップＳ２０５にて上記ＡＳＩＣ１３のインク使用量カウンタのカウント値が「０」にクリアされ、ステップＳ２１０でフラッシュメモリ１４が参照され、インクモードが顔料系に設定されている旨が把握される。

【００７５】ＣＰＵ１２はさらにフラッシュメモリ１４を参照してステップＳ２１５で当該顔料系に適合する印刷条件を読み出し、ステップＳ２２０以降の処理にて印刷を実行する。このとき、ＡＳＩＣ１３の上記カウント値は印刷実行とともに増加する。このまま印刷を続けるとやがて印刷終了に至るが、印刷終了に至る前の時刻ｔ４において利用者が何らかの理由でインクカートリッジ４３（本例ではライトマゼンタ）を取り外したときには、上記コントロールＩＣ４１ａがインクカートリッジが取り外された旨の信号を出力する。

【００７６】この結果、ＣＰＵ１２が実行していた印刷処理は中断され図８のフローが実行される。すなわち、

ステップＳ３０５にて液晶表示体３１上にエラーメッセージＣを表示させ、利用者が同エラーメッセージＣを視認することによってインクカートリッジ４３を装着し直すことを促す。利用者がインクカートリッジ４３を装着するとステップＳ３１０の判別を経てステップＳ３１５以降の処理を実行するが、誤って時刻ｔ５にて他のインクカートリッジ４３と異なる染料系のインクが充填されたインクカートリッジ４３を装着した場合には、ステップＳ３１５～ステップＳ３３０の処理によってさらにエラーメッセージＢが表示される。

【００７７】利用者が当該エラーメッセージを視認することによって時刻ｔ６でインクカートリッジ４３を顔料系インクが充填された適切なカートリッジに変更すると、ステップＳ３２５の判別を経てステップＳ３３５にてフラッシュメモリ１４にアクセスし、顔料系のカウンタ係数を読み出す。そして、ステップＳ３４０にて上記時刻ｔ４の時点までカウントしていたカウント値に当該カウンタ係数を乗じることによってインク使用量を算出し、ステップＳ３４５にて上記コントロールＩＣ４１ａを介してカートリッジメモリ４３ａを更新する。すなわち、印刷の途中でインクカートリッジ４３が取り外されたとしても、それまでのカウント値が保持されるとともに再び適正なインクカートリッジ４３を装着したときにインク残量が更新されるので、カートリッジメモリ４３ａに記憶されるインク残量が適正なものとなる。

【００７８】このように、本発明においては、インクカートリッジに搭載された不揮発性メモリにインクの種類やインクの残量を記憶し、インク供給系にインクを供給したらそのインクの種類を記憶し、印刷時に同記憶したインクの種類と上記不揮発性メモリに記憶されたインクの種類を比較する。この結果、両者が一致するときに当該インクの種類に適合した印刷制御を実行することができ、インクの混合を防止することができる。また、ヘッド駆動に応じてインク使用量を算出し、インクの残量を更新するので適正なインク残量を判定することができる。

【図面の簡単な説明】

【図１】インクジェットプリンタの内部構成を示す概略斜視図である。

【図２】インクジェットプリンタのブロック図である。

【図３】フラッシュメモリのメモリマップの要部を示す図である。

【図４】ヘッド駆動部にて生成する印加電圧のパターンを示す図である。

【図５】プリンタ制御装置が実施する制御の概略を示した概略図である。

【図６】ＣＰＵが実行する処理のフローチャートである。

【図７】ＣＰＵが実行する処理のフローチャートである。

【図８】ＣＰＵが実行する処理のフローチャートである。

【図９】エラーメッセージの表示例を示す図である。

【図１０】エラーメッセージの表示例を示す図である。

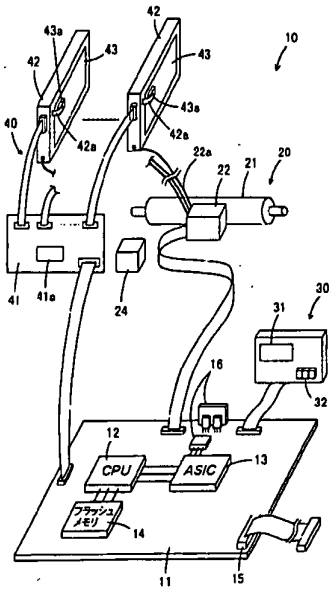
【図１１】エラーメッセージの表示例を示す図である。

【図１２】各部の動作を示すタイミングチャートである。

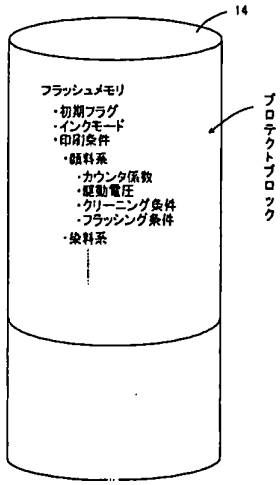
【符号の説明】

１０…インクジェットプリンタ
１１…メイン基板
１２…ＣＰＵ
１３…ＡＳＩＣ
１４…フラッシュメモリ
１６…ヘッド駆動部
２０…印刷部
２１…ローラ
２２…ヘッド
２２ａ…チューブ
３０…パネル部
３１…液晶表示体
３２…操作ボタン
４０…カートリッジ部
４１…サブ基板
４１ａ…コントロールＩＣ
４２…カートリッジホルダ
４３…インクカートリッジ
４３ａ…カートリッジメモリ
５０…パーソナルコンピュータ

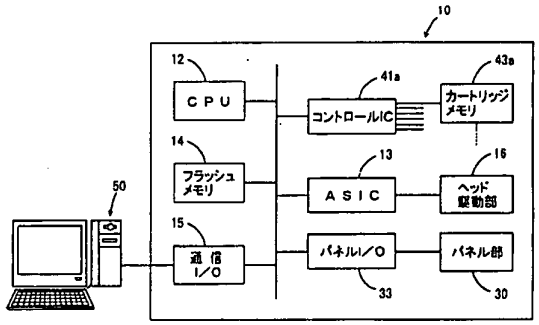
【図１】



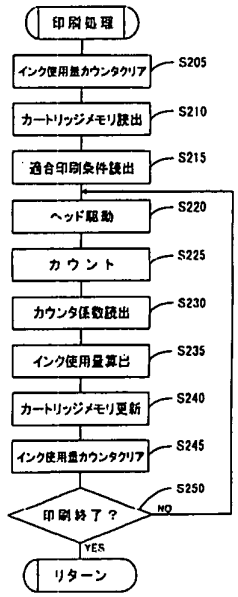
【図３】



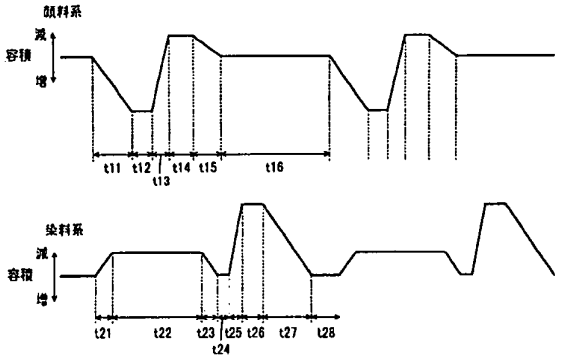
【図２】



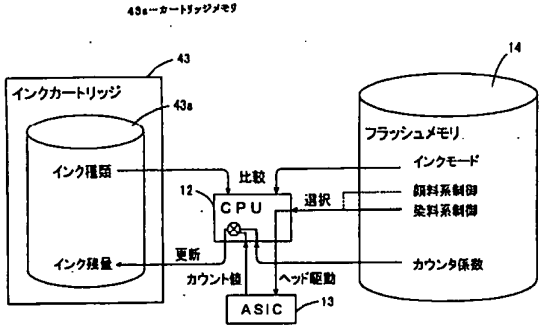
【図７】



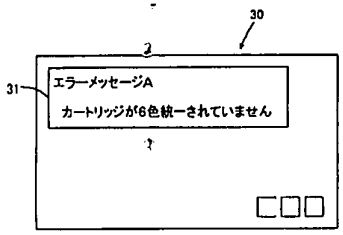
【図４】



【図５】



【図９】



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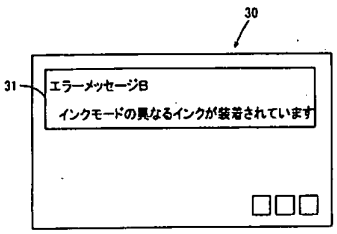

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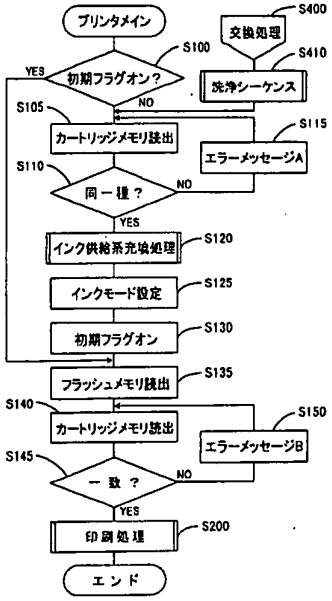

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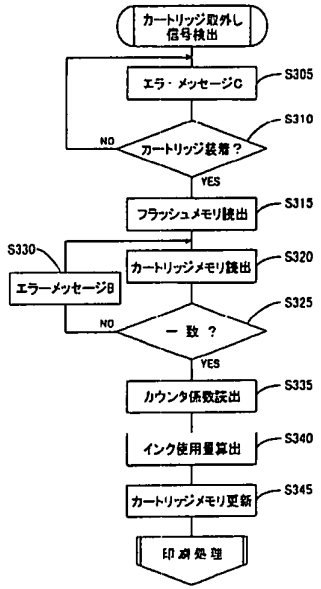

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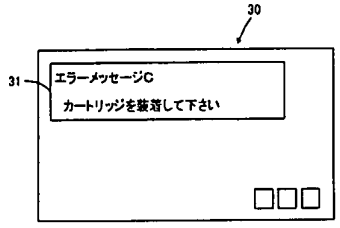

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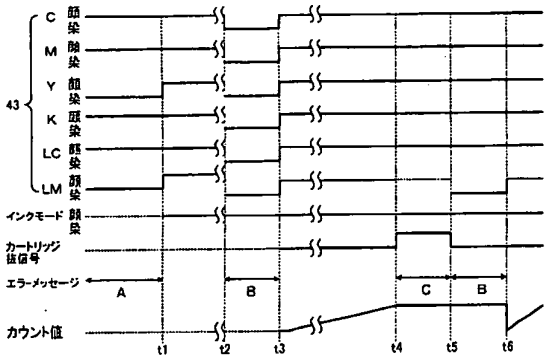

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Ｆターム(参考) 2C056 EB20 EB45 EB49 EB56 EB59
EC41 EC42 KC01
2C061 AQ05 HH03 HJ10 HK05 HK11
HK23 HN02 HN15